Gas Journal

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Editorial Notes

Radiant Heat and Comfort

We conclude publication to-day of the recent paper by Dr. Harold Hartley before the Institute of Fuel. The contribution is notable in the first place as an example of the unobtrusive research done by numerous workers in the allied industries which are epitomized in the membership list of the S.B.G.I. These industries have interests and aims which are bound up with the scientific development of the manufacture, distribution, and utilization of town gas; yet, in considering the extent of the personnel and capital associated with the Gas Industry, it is a common error to focus attention only on the actual supply undertakings, and to forget the driving force for advancement inherent in the closely affiliated industries.

Dr. Hartley's paper is significant not only as a gesture by Messrs. Radiation Ltd. of willingness to make generally known the results of their work, but also as an important step towards ascertaining for the mutual enlightenment of gas consumer and supplier in what respects the existing type of gas fire succeeds, and in what respects or conditions it fails as a comfort promoting source of radiant heat. The days have surely passed, if they ever existed, when it was desirable to conceal the truth either from supplier or consumer. There is much to gain in the long run from an ample knowledge of the functions required of ideal heating systems, and of the extent by which existing systems fall short of the ideal. Gas should always be able to compete with electricity for heating on the ground of cost, and from the evidence adduced by Dr. Hartley it is also clear that the gas fire is in no way inferior to the electric on the score of the quality of the radiation emitted. The evidence, in fact, points to some superiority in the comfort promoting qualities of the radiation from a gas fire as compared with an electric heater, but this should not be allowed to obscure the need for much further study of a problem the biological character of which alone introduces very complex considerations.

Heating Systems

Although central heating and the use of closed stoves have become almost universal in some countries, it has always seemed reasonably certain that the open fire would never be entirely displaced from favour in Great Britain. This may be attributable to climatic and psychological causes. The cheerful glow of an open fire is a desirable offset to the vagaries of a weather which can change with proverbial frequency and suddenness from brightness to gloom; while, on the other hand, long spells of intense cold need not be provided for here. The work of Fishenden and Willgress cited by Dr. Hartley has shown to what extent popular prejudice may have a scientific basis, and has revealed the complicated nature of the question of domestic heating.

The maintenance of bodily comfort is shown to be more a question of controlled loss of heat than of heat input from outside. The normal loss of 450 B.Th.U. per hour sustained by a sedentary person comprises some 43% by radiation, 30% by convection, and 20% by evaporation. There are several ways of modifying and controlling these heat losses—for example, by regulating the temperature of the surrounding walls and objects, by modulating the temperature, humidity, or relative movement of the air, or, finally, by providing a low or high temperature source of radiant heat. Though any single one of the factors wall temperature, air temperature, or radiant heat source might in theory be sufficiently intensified to overcome deficiencies in the other two, the scope is strictly bounded in practice by biological limitations. Thus there are obvious limits to the allowable variations in the temperature or humidity of air which has to be breathed, while the quantitative and qualitative limits to the radiation which can be endured by the skin have been the special study of Dr. Hartley.

Air Temperature

The influence on breathing is conceivably doubly complicated. Some time ago Sir Leonard Hill recorded an observation that even the quality of the radiation, quite apart from air temperature, was important in that certain rays in the infra-red region incident on the skin caused a swelling of the mucous membrane and stoppage of the nose, the effect being of a reflex character operating through the nervous system. As regards the effect of temperature *per se*, Dr. Hartley states: "With cold air the mucous membrane of the respiratory passages contracts and there is an increased flow of lymph to the surface, whereas if the air is hot the membrane expands and the conditions set up are much more favourable for the development of the germs of colds and other ailments." Nevertheless the occasional heating of churches has been economically performed by air

heating, which is rapid and entails less thermal expenditure than the warming of cold stonework walls.

In general we appear to prefer to live in the stimulating atmosphere of cooler air at about 55° F., if the additional radiant energy requisite for warmth is available. Alternatively Fishenden and Willgress have shown that comfort can be obtained in the absence of any additional source of radiation in a room with the walls and air both at 65° F. The several potentialities cited in the paper should be carefully noted, but of special significance is the remark that with an air temperature below 45° F. " it was found impossible to get comfortable between the extremes of intense cold and scorching radiation."

The Quality of Radiation

ONE of the outstanding advantages of the gas fire is its utility for occasional heating in rooms not in continuous occupation, or for counteracting the effect of sudden changes of atmospheric temperature. A source of radiant heat liable to be called into sudden use is one from which people are likely to attempt to seek immediate bodily warmth in the midst of the cold surroundings of a room not previously heated. Gas fires are likely to be subjected to such demands, and it is open to question whether everything possible has yet been done to render them immune from criticism. Dr. Hartley records that comfort is attainable with an intensity amounting to 75 B.Th.U. per sq. ft. per hour when the air temperature is 55° F. The intensity of radiation varies inversely as the square of the distance from the fire, and it is a question of some importance whether a gas fire is as " approachable " as it might conceivably be if the quality of the radiation were suitably controlled.

The scorching effect at high intensities has been shown to be due in part to the selective absorption by the upper layers of the skin of infra-red rays of about 3 microns wave length which are emitted in considerable intensity by gas and electric fires. It is impossible apparently to eliminate this section of the wave band economically, but it is conceivable that the intensities of rays somewhat shorter than this might be preferentially increased by arranging for the attainment of higher temperature by the radiants. Alternatively it was proposed at a recent Institution meeting to construct a gas fire of incandescent mantles, and to eliminate glare by means of a tinted vitreosil screen which would be transparent to most of the heat rays. On the whole question Dr. Hartley could doubtless say more, and the results of further work will be awaited with interest.

Value of Demonstration

THERE should be no disagreement with the contention of Mr. Tallentire, of Lurgan, that we should do all in our power to ensure that all street lighting is worthy of the Gas Industry. We know that in certain areas gas companies have an uphill task in persuading local authorities who have control of the maintenance of public lamps, and simply purchase the gas, to bring their installations up to date. But no stone should be left unturned to make such authorities appreciate exactly what modern gas lighting really is. Nor was there better time than the present for such action, when the necessity for good lighting in the interests of safety is being more fully realized. A great deal can be done by demonstration; typical proof of this was given by Mr. Tallentire in his paper (published in the " JOURNAL " last week) to the Irish Association of Gas Managers.

A short time ago the Lurgan Urban District Council arrived at the opinion that the town needed more light, and the suggestion was made that electric lamps should be installed in place of a number of existing gas lamps. Whereupon the Gas Department erected " samples " of modern gas lighting on two of the main thoroughfares. So successful was this demonstration that the local authority decided to extend the samples to the entire length of the two thoroughfares, and the Gas Department was instructed to prepare a scheme to bring all the streets in the district up to the standard set by the experimental section. The scheme was adopted with handshakes all round. The final scene of the last act—which included a pretty piece of floodlighting—was the conversion of the existing electric lamps to gas, thereby completing a thoroughly modern installation. The result of Mr. Tallentire's enterprise should provide incentive to others to demonstrate to local authorities and the public generally the efficiency and economy of up-to-date gas lighting. The gas consumption for public lighting at Lurgan, it may be mentioned, has been more than doubled by the modernization.

Mr. Tallentire explains how he set about the work, and his details will be helpful. The relationship between concrete streets and damage to lamps at Lurgan is interesting. During the " off " season it was the practice to remove the lamps from the columns, to avoid damage from stone throwing. Since the introduction of concrete streets, and consequent lack of loose stones by which children are tempted, this is no longer necessary. Also the mantle consumption per nozzle per season in concrete streets is 0·6, compared with 1·3 in non-concrete streets. In regard to the effective life of mantles, valuable information was contained in the annual report of Mr. Colquhoun, City Lighting Engineer at Sheffield. Extracts from the report were published in the " JOURNAL " for July 11 last. The average effective life of the gas mantle during the year under review was 1,795 burning hours, compared with only 881 burning hours in the case of the electric lamp. This is an increase over the previous year of 195 hours for gas mantles, but a decrease of 196 hours for the electric lamp. The life of the small inverted mantle is extraordinarily good. In the days of the old upright mantles the average life was 270 hours. The life of the inverted mantle was always much greater, but it has steadily improved from year to year. In the year 1926-27, for example, the average life was 1,153 burning hours. This, it will be seen, has been greatly improved upon. We quote these figures here as an indication of the vast difference between a modern gas installation and one of even a few years ago. And it is the duty of gas undertakings, by demonstration and keenness, to prevent local authorities arriving at decisions by comparing antiquated gas equipment and up-to-date electrical installations.

A Good Maxim

THE Queen Street Showrooms of the Belfast Corporation Gas Department were greatly admired by the members of the Irish Association of Gas Managers when they assembled there for their annual meeting. It should go without saying that gas lighting is featured in its most attractive forms. Could it be otherwise in a city where, with keen electrical competition, something over 99% of the street lighting is by gas? The showrooms are, of course, commodious, for otherwise they could not adequately represent the big and enterprising

undertaking of which they are a part; and in accordance with the best modern practice there is nowhere even a hint of crowding. It is better to see one cooker wholly than to get a hazy idea of a hundred. Not that there is one cooker only in the Queen Street Showrooms! On the contrary, there is a galaxy of apparatus in captivating enamel finishes and of up-to-date patterns.

And any ordinary consumer is able to have a cooker finished in enamel and fitted with oven temperature control, for there is a model of this character displayed, with a note of the rental "on simple hire." No need, here, to turn and inquire what the electricians are willing to offer—you can "do it by gas." Briefly, the Corporation Gas Department believe that to-day "we must give people what they want, and not what we would like them to have." How simple does the policy look set down thus; at the same time what a wealth of meaning is attached to it. There may be some consumers in Belfast who cannot purchase a fairly expensive cooker—there are certainly others who, for different reasons, would find it undesirable to do so—but such persons might nevertheless have a fancy for an enamelled temperature-controlled cooker, and the Gas Department are prepared to meet them. If they do not, the electricians are round the corner—or may be not even so far away as that. This cooker policy is only one indication of the progressive lines on which the Belfast Gas Department is run. Not without reason is Mr. J. D. Smith extolled by his Chairman and other civic authorities.

Does It Pay?

We heard recently of a certain member of a local Council which owns a gas undertaking expressing strong disapproval of a recommendation, which he dubbed a "mad scheme," to open a central showroom for the display of gas appliances—and, be it recorded, this gas undertaking is in competition with a keen company-owned electricity concern. The sole means previously available for displaying appliances was at the Gas Offices situated in the local Town Hall, where, we gather, very unsuitable accommodation was available. We are glad to know that the recommendation was finally adopted.

Much has been said, and much no doubt will continue to be said, on the subject of whether or not a showroom is worth while. The considered opinions of leaders of the Industry were given in a series of articles which appeared some three years ago in the "Gas Salesman," to which we would refer in support of our firm conviction that an up-to-date gas showroom in every district is not merely worth while, but essential. The question may be framed more concisely: Is the expense entailed in building new and up-to-date showrooms or modernizing existing ones justified by the results? And this finally resolves itself into: Can we afford to do without a showroom?

Our sympathies go out to gas managers who, in their efforts to meet the demands of modern times, are faced with local authorities or boards of directors members of which lack understanding of essentials. It is unfortunate for the Industry that the control of any gas undertaking should be connected with any man who expects a showroom necessarily to pay for itself in actual cash and credit sales of appliances passing through its own books. In the instance under discussion another Councillor fortunately pointed out that the underlying principle at stake was the extension of gas sales. In any case the showroom is the "face" of the undertaking which is turned to the public. It is essential to show a face reflecting the initiative and progressiveness of the concern—the outward and visible sign, as it were, that the public have an efficient gas undertaking catering for them in the district.

Trade Names

In a note recently on the subject of good advertising we commended to readers one of the advantages of obvious "tie-ups"—that at the time of seeing an announcement some possibly good potential customers may not feel inclined to tax their brains. When one has a story to tell there is no doubt more than one method of "getting it across," but even so there is much to be said in favour of the easiest way.

A further point calling for consideration in connection with publicity is the trade name. With the remark that trade names have grown in numbers during recent times so rapidly that it is impossible to have even a nodding acquaintance with more than a very small proportion of the newer arrivals, we would say that we have in mind names applied rather to a commodity than for the purpose of distinguishing a pattern. At any moment it may become urgently necessary to identify some one of these names. In such a time of trial, a good memory will be a "pillar of strength," and a reliably written-up note-book, perhaps, a still stronger pillar. But at the best, difficulty must occasionally arise, and therefore it appears to us that there must be undeniable advantages in a tie-up—whenever, and as far as, possible—between a trade name and the particular commodity which it is intended to represent.

Forthcoming Engagements.

Sept. 1-4.—Second International Gas Conference, Zurich.
Sept. 6.—North British Association of Gas Managers.—Annual Meeting in Inverness.
Sept. 7.—Southern Association (Western District).—Commercial Meeting at Dartmouth, 2.30 p.m.
Sept. 11.—I.G.E.—Finance Sub-Committee, 9.45 a.m.; Membership Sub-Committee, 10.30 a.m.; General Purposes Committee, 11.15 a.m.; Gas Education Executive Committee, 4 p.m.
Sept. 17-20.—Association of Public Lighting Engineers.—Eleventh Annual Meeting at Aberdeen.
Sept. 20.—I.G.E.—Refractory Materials Joint Sub-Committee (Stoke-on-Trent), 2.30 p.m.
Sept. 20.—Wales and Monmouthshire Association.—General Meeting at Porthcawl.
Sept. 24-26.—B.C.G.A.—Annual General Meeting and Conference at Sheffield.
Sept. 25.—S.B.G.I.—Meeting of Council, Royal Victoria Station Hotel, 4.45 p.m.
Sept. 27.—I.G.E.—Liquor Effluents and Ammonia Sub-Committee, 2.30 p.m.
Sept. 28.—I.G.E.—Joint Research Committee, 10.30 a.m.; General Research Committee, 2.30 p.m.
Oct. 5.—North of England Association.—Autumn Meeting. Presidential Address of R. N. Duxbury and visit to I.C.I. works at Billingham.
Nov. 6 and 7.—I.G.E.—Autumn Research Meeting.
Nov. 8.—S.B.G.I.—Autumn General Meeting, Hotel Metropole, London.

1934 "Journal" Directory.

Page 2. Alnwick. W. Turnbull, E. & M., deceased.

Page 125. Burnley. A. F. Ames appointed Lighting Superintendent vice J. H. Clegg, resigned.

Personal

Alderman J. BARLOW, Chairman of the Accrington District Gas Board, was the recipient of many congratulations on Aug. 22, on attaining his 80th birthday. The members intend to honour Alderman Barlow by placing his portrait in the Boardroom.

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Prof. JOHNSON SMITH, of Birmingham University, has been appointed Gas Examiner for Birmingham. He succeeds the late Prof. H. F. W. Burstall, who held the appointment for many years, and whose death was recently announced in these columns.

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Mr. T. HANDEL (Senr.), the Managing Director of the Ilminster Gas, Light, Coal and Coke Company, Ltd., retired on pension in July last after just over 46 years' service, and was succeeded by his son, Mr. T. HANDEL (Junr.), as Manager and Secretary.

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As announced at the meeting of the Irish Association at Belfast (last week's "JOURNAL," p. 413) Mrs. EILEEN MURPHY has been appointed to conduct a Home Service Section of the British Commercial Gas Association. The primary object of the Section is to co-ordinate the activities of women engaged in the Industry and to foster additional contacts between gas undertakings and the housewives in their districts. Before making any recommendations, Mrs. Murphy is conducting a personal survey of existing practice by visiting some of the undertakings where this work is being thoroughly carried out.

Obituary

The death has occurred, following an operation for appendicitis, of Mr. WILLIAM TURNBULL, Engineer and Manager to the Alnwick Gas Company. Mr. Turnbull, who was 40 years of age, was the eldest son of Mr. Charles Turnbull, Managing Director and Secretary of the Company. He was educated at the Dukes School, Alnwick, and Armstrong College, Newcastle, and served his apprenticeship with Messrs. Drakes, Ltd., of Halifax. Before Mr. Turnbull took up the management of the Alnwick Gas-Works he was at the Hele Works, Ilfracombe, for nine years.

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The death is announced of Mr. GEORGE DUNCAN, at one time Provost of Stonehaven, a Director and former Chairman of the Stonehaven Gas Company. Mr. Duncan was 66 years of age.

News In Brief

A Domestic Appliance Exhibition has been held at Steinway House, Accrington, with cookery demonstrations and lectures.

Price Reduction.—Stevenston Gas Company, Ltd., have intimated a reduction in the price of gas of 5d. per 1,000 c.ft. after their next survey.

Alteration of Declared Calorific Value.—The Lichfield Gas Company, in compliance with the Gas Regulation Act, 1920, give notice that from Dec. 1, 1934, the calorific value of the gas which they intend to supply will be altered from 450 B.Th.U. to 500 B.Th.U. per c.ft.

The Dundee Gas Committee have unanimously agreed with the recommendation of the Engineer and Manager, Mr. John Wilson, to accept the offer of the National Benzole Company, Ltd., to take all the Department's production of benzole at the standard market price.

A Hundred Years Ago.—"Chelmsford, Aug. 22, 1834. —The interior of the convict prison in Springfield is now admirably lighted by five gas lamps. There are also three lights in the governor's house, where an experiment of cooking with gas was successfully made."—From the *Essex Chronicle* for Aug. 24.

Mossley and Saddleworth Gas Company, Ltd., has been registered to acquire the gas undertaking authorized by the Mossley Gas Act and Orders, 1885 to 1934, to manufacture and supply gas, &c. The nominal capital is £250,000 in £1 shares, and the Directors are Major Julian Day and Mr. G. M. Gill.

Skelmanthorpe Gas Company, Ltd., has been registered as a public company to take over the business carried on by the Skelmanthorpe Gas Company, Ltd. (in voluntary liquidation). The nominal capital is £2,000 in 10s. shares, and the Directors are: Messrs. R. Heaton, A. E. Drummond, C. Earnshaw, V. Hinchcliff, A. Lawton, G. Tinker, and A. Whiteley.

The Sale by Tender of £15,000 Ordinary Stock carrying a standard rate of dividend of 6%, in lots of £10 each, is announced by the Great Wigstone Gas Company. Forms of Prospectus containing the conditions of sale and application forms may be obtained from the Company's solicitors, Messrs. Ingram & Co., 8, Friar Lane, Leicester, or from Mr. A. T. Harris, Engineer, Manager, and Secretary, Gas Offices, Great Wigstone, Leicester.

Bottled Gas in Germany.—A good deal of attention is being paid in the Ruhr mining district of Germany to the question of utilizing compressed gas for the driving of the engines of commercial motor vehicles. It is felt that commercial vehicles operating in the areas contiguous to gas production centres and within a reasonable distance therefrom could be adapted to the use of coal gas with advantage to their owners and to the gas producers.

An Interim Dividend of 2½% less income-tax will be paid by the Directors of the European Gas Company, Ltd., on Oct. 1. The interim dividend paid last year was at the same rate.

"**Cooking With Perfect Control**" is the title of an additional publication in the "A Thousand-and-One Uses for Gas" series which is being issued by the British Commercial Gas Association. The publication deals with the report of the Good Housekeeping Institute who recently carried out exhaustive tests with gas and electric cookers. The report emphasized that gas, unlike electricity, can give any degree of heat required as well as being very much speedier and cheaper.

Amiens Gas Supply.—According to the *Financial Times*, the European Gas Company is in danger of losing one of its concessions—that of the City of Amiens. The English Company has for 30 years supplied gas to the inhabitants of Amiens in conjunction with the Compagnie du Gas Francais, a French Company which also holds a concession for a large part of the city. The concessions of both these concerns expire on Sept. 1, 1936, and the French Company is competing for the entire concession.

Stonehaven Gas Company's New Showrooms were opened on Aug. 20. Mr. James Hall, Chairman of the Board of Directors, presided at the opening ceremony, which was performed by Mr. Charles George, who has been a Director of the Company for 45 years. Mr. George said that in spite of the introduction of electricity into the town the Company would hold its own. Provost Thomson complimented Mr. John Scobie, the Manager, whose careful management had helped greatly to bring the Company to its present state of efficiency. Mr. J. B. Cunningham proposed a vote of thanks to Mr. George. The Gas-Works were afterwards inspected and a demonstration was given of heating and lighting appliances exhibited in the showroom.

Leeds' Success In Children's Day Procession.—In the recent Children's Day procession at Leeds, the Corporation Gas Department secured a deserved success in winning the first prize with an original entry. A lorry carried a complete police court in which children played the necessary rôles. The defendant, Mrs. Coal, was sentenced to "be carbonized in a gas-works retort and all bye-products recovered for the benefit of everybody." On the front of the lorry was carried a placard on which was written: "Trial of Mrs. Coal for smoke pollution of the air in Sunshine Colony." A newspaper boy accompanied the lorry selling the "Daily Health." His placard announced: "Verdict in Coal Trial. Sir Ebony Black turns white." The display caused no little amusement to many of the barristers and solicitors who were engaged in the Assizes at the Town Hall, outside which the judging took place.

The National Smoke Abatement Society will hold their sixth Annual Conference at Glasgow in conjunction with the Scottish Branch from Sept. 27 to Sept. 29. At 8 p.m. on Thursday, Sept. 27, there will be the reception by the Lord Provost of Glasgow, Mr. Alexander B. Swan, in the City Chambers. The President, Mr. H. A. Des Vœux, M.D., will take the chair at the General Meeting on the Friday at 9.30 a.m. and will deliver his Address. On the completion of the third session of the Conference on the Saturday morning, the party will depart for a motor-coach outing to the Trossachs.

Santiago de Chile.

Third Order for Glover-West Vertical Retorts.

The contract recently received by Messrs. West's Gas Improvement Company from the Compania de Consumidores de Gas de Santiago, to which reference has been made in the daily Press, is for a plant of 32 continuous vertical retorts of the Glover-West steaming model, with comprehensive coal and coke handling systems and waste-heat recovery equipment. The new unit will form an extension to two existing Glover-West installations at the Company's San Borja Works. The first of these, started up in 1927, was described in an article in *West's Gas* for December, 1928, which was reprinted on p. 45 of the "GAS JOURNAL" for Jan. 2, 1929. A brief reference to the second installation, started up early in 1929, occurs at the end of the same article.

The estimated total daily gas-making capacity of Glover-West plant at Santiago, including the installation now in hand, will reach approximately 6½ million c.ft.

Gas Industry and T.U.C.

The activities of the British Commercial Gas Association in co-operation with the local gas undertakings are exciting great interest in Weymouth, Dorchester, and District, where the annual Trades Union Congress is being held (Aug. 27 to Sept. 8). Not only is gas being brought more prominently than ever before the notice of the inhabitants of the district, but delegates to the congress, coming from every part of the British Isles, are seeing, wherever they go, evidence that gas is very much alive and very much up to date.

The reason for this activity lies in the fact that during the period of the T.U.C. assembly six cottages dedicated to the memory of the "Tolpuddle Martyrs" are to be opened —and these houses are "all-electric." The Gas Industry's intensive campaign is the answer.

First of all, the fine new demonstration van of the Gas Light and Coke Company is touring the district. There are four big windows in either side, used to show the latest designs in gas fires and water heaters and to display slogans. Inside, there is a compact display of the newest kinds of gas equipment, with an attendant always at hand to explain how everything works.

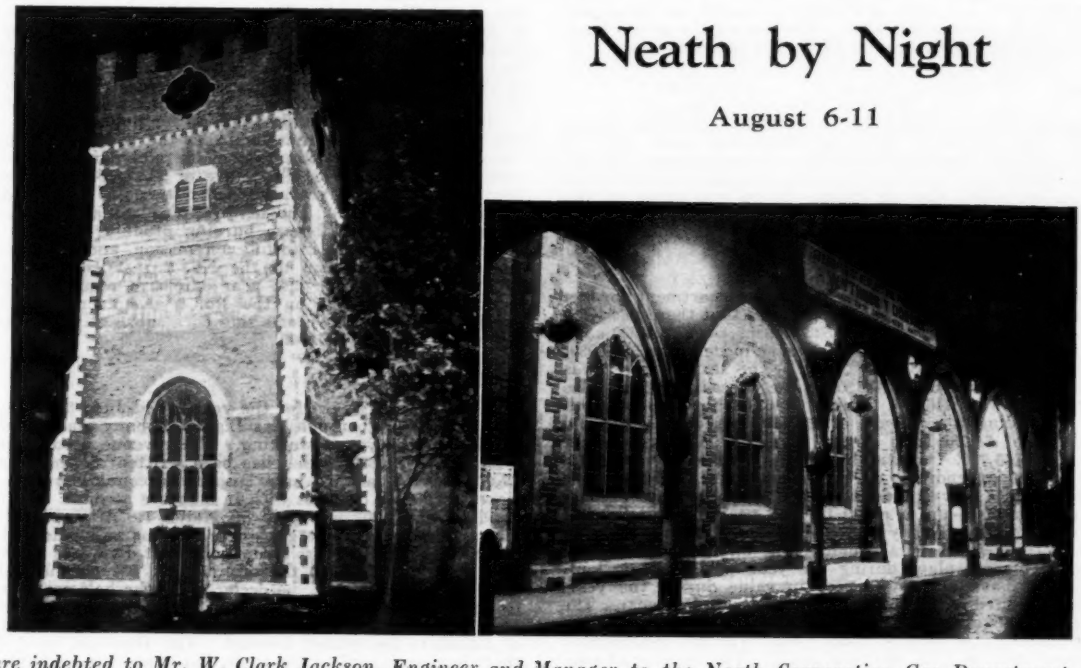
Secondly, in the grounds of the Weymouth Gas Company, facing Sidney Hall where the Congress delegates meet, a hoarding has been erected 60 ft. in length and 15 ft. in height. Its message, in big letters, is "Welcome to Weymouth. Get Up-to-Date With Gas." At night the hoarding is floodlit by gas.

Thirdly, throughout Weymouth and Dorchester, 62 posters are on view. Each poster links up with one or other of the 32 biggest cities from which delegates have come. "Are you from Birmingham (Cardiff, Leeds, Glasgow, &c.)? Get Up-to-Date With Gas."

Fourthly, special window displays have been prepared by

Neath by Night

August 6-11



We are indebted to Mr. W. Clark Jackson, Engineer and Manager to the Neath Corporation Gas Department, for these illustrations of floodlighting by gas during the week of the National Eisteddfod. The photograph on the left is of St. Thomas' Church; the other shows the front of the Gwyn Hall. The floodlighting is the first of its kind carried out at Neath, and attracted great public interest.

the B.C.G.A. Studios for both the Weymouth and Dorchester Gas Companies' Showrooms. There are five displays. One of these (previous page) is approximately 8 ft. by 8 ft., and is made in plywood and "Tallboard." The background is of "Tallboard" and shows a boat and island with shaded sky effects lettered in dark mauve, the sky being sprayed from orange to lemon. The Tolpuddle Martyrs are superimposed, and there is a built-up archway of dark mauve and lemon. Two parchment scrolls carrying slogans and real chains from handcuffs complete realistic effects. The slogans show a link-up between the Gas Industry and the T.U.C.

Large spaces have been taken in the local Press—particularly in the *Dorset Daily Echo*. In this paper, which is reporting fully the Congress activities, an advertisement appears daily.

Finally, a large quantity of the latest folders and booklets is being distributed.

The Advance of Science in the Kitchen.

Gas Light and Coke Company's Exhibit.

The Gas Light and Coke Company has recently given to the Science Museum, South Kensington, an interesting exhibit forming one of a series of dioramas in the Children's Gallery. The series consists at present of two dioramas illustrating the advance of science in the kitchen of the English home.

The first diorama depicts a kitchen in a middle-class house in London at the latter part of the 18th Century. Compared with the second diorama which depicts a modern all-gas kitchen of the type now being installed by the Company, this old-fashioned kitchen gives one a very clear idea of the advance which has been made in less than two centuries.

The Company's diorama is of a kitchen representative of that to be found in a medium-sized London house built in the year 1934. The scene is typical of the architecture and decoration of the present time and shows the attention which is now being given to kitchen planning from all points of view—utility, artistic lay-out, and saving of labour. The kitchen equipment consists of a one-level vitreous enamelled gas cooker with thermostatic control. The cooker is installed in a recess so that it is lineable with and on the same working plane as the food preparation table and the sink. Built in beneath this table is a gas-operated refrigerator which is seen with the door partly open to display the food and drinks which it contains. Over the sink, fitted into the recess provided for it in the wall is an instantaneous gas water heater which, by means of a mixing valve, enables water to be obtained at any desired temperature.

The kitchen is illuminated by a gas lighting burner of modern design. Through the window of the kitchen a view of suburban London is obtained. In the foreground in the street below is one of the Company's showrooms, while a waterless gasholder looms faintly in the background as a representation of the source of the energy to operate the labour-saving appliances in this up-to-date house.

The "Supervector" Panel Heater.

Messrs. Falk, Stadelmann, & Co., Ltd., have recently marketed a new heater of novel design and construction which is eminently suitable for entrance halls, clubs, shops, churches, cinemas, &c. The outstanding features claimed for this heater are: It is hygienic, economical, great heating capacity, modern finish and design, can be used with or without a flue outlet.

Owing to the construction of the interior, cold air is drawn in through gauze panels, heated, and passed out into the room again. This action assists ventilation and gives warmth without stuffiness. One of the hygienic features when the heater is fitted with a flue outlet is the separation of the warmed air from contact with the gas jets by means of a double casing and an internal chamber. The gas consumption is 3 c.ft. per burner per hour. A polished aluminium reflector is placed behind the burners which, in conjunction with a ruby glass door panel, gives a warm and cosy appearance. The "Supervector" panel heater is supplied in three finishes: Art black stove enamelled, heat-resisting coloured paint of putty shaded black, and brush grained dark oak.

Gas Undertakings' Results

Ellesmere.

The Ellesmere Port Gas Department reports a decrease in the gross profits of £2,190, which was largely accounted for by the increased cost of manufacture and distribution, and the discount of £915 which was allowed to consumers. Due to the introduction of a new scale of charges to benefit the consumer, the net drop in income was £540. The loss on the year's trading amounted to £3,089, against £2,809 the previous year.

Hereford.

The report of the Hereford Gas Department states that during the past financial year a profit of £1,325 was made, and, in addition, £250 had been placed to the reserve account. During the year £3,739 was spent on the maintenance of works, and £1,570 on renewals. Out of income £1,065 was spent on the hire of gas fires and boilers.

Stockport.

The annual report of the Stockport Gas Department for the financial year ended March 31, 1934, reports that there has been an increase in gas delivered of 248,823 therms, or 55,294,000 c.ft., which is an increase of 4·74%. The revenue-income was £239,939, compared with £235,363 last year. The expenditure was £192,964, an increase of £4,405 over the preceding year. The trading profit was £46,975, against £46,804 for the previous period. Including the amount of £3,943 carried forward, and the addition of £4,782 from sundry rents, &c., the gross profit amounts to £55,700. Capital has been increased by £28,070, making a total expenditure on this account of £1,042,890. The outstanding debt now stands at £344,920, an increase of only £3,350 on last year, and is equal to £282 per million cubic feet of gas made. The quantity of coal carbonized during the year was 62,777 tons. The total quantity of oil used in the carburetted water gas plant during the year was 67,813 gallons. Tar products have again improved in value during the year, which has resulted in an increase of £1,204 over last year. The revenue from coke decreased by £2,097 owing to the reduction in prices during nine months of the year. The gas unaccounted for amounts to 4·93% on the total make. The number of consumers on March 31 was 42,241, of which 20,808 are supplied through ordinary meters and 21,433 through prepayment meters. During the year there was an increase of 2,102 consumers. The sales of all classes of appliances through the showrooms constituted a record turnover, amounting to £43,700, against £25,000 last year.

Wallasey.

The final financial tables of accounts and results of the working of the Wallasey Gas Department for the year ended March 31 last have now been issued, in which it is recorded that the total income is £185,895, as compared with £185,019 last year, and that the gross profit is £33,988. The quantity of gas sold is 855,446,000 c.ft., representing an increase of 14 million c.ft., of which amount 453 million is by ordinary meter, 318 million by prepayment meter, and 84 million for public lighting. There are now 3,439 multiburner lamps in the county borough, and the system of conversion to modern globular-type fittings is making good progress. The make of gas per ton of coal carbonized for the past year is 17,697 c.ft., or 83 therms, and the coke sold is 9·9 cwt. The new (1932) installation of 103 inch vertical retorts with breeze burning producer plant and coke screens has now come into full commission, and the reconstruction and modernization of the No. 2 installation is now in progress. During the past year extensive repair and renewal work was carried out on the No. 5 gasholder. The sale of appliances at the showrooms showed a substantial increase over last year, totalling £15,000.

Wellingborough.

The Directors' report for the year ended June 30, 1934, shows that the Wellingborough Gas Light Company made a profit of £10,624 on the year's working. The revenue account includes a charge of £4,500, which has been written off the balance of £7,000 carried forward as a suspense account last year. This leaves £2,500 to be dealt with in a future account. An interim dividend of £4,207 was paid on March 1. After providing for interest and sundry charges, there remains an available balance of £9,234. The Directors recommend that dividends at the same rate as before, 7½% on the original and 6% on the additional shares, less income-tax, be declared for the half-year, and paid to the shareholders on Sept. 1. The payment of dividends, and tax thereon, will absorb the sum of £4,687, leaving a balance of £4,548 to be carried forward. The Directors have decided that, having regard to the limited storage now available, additional accommodation should be provided without delay, and have accordingly accepted the tender of Messrs. R. & J. Dempster, Ltd., for the erection of a gasholder of one million c.ft. capacity.

The Marketing of Coke

By F. M. H. TAYLOR, Ph.D., M.Inst.Fuel, M.I.H.V.E.

Being the second of a series of articles dealing with specialized phases of the gas coke market, the first of which appeared in our issue of August 1, p. 259

Coke for Central Heating

Automatic control of the hand-fed coke boiler was introduced because competition with other forms of thermostatically controlled firing made economy and the avoidance of overheating a necessity. The need for constant attention meant relatively high labour costs, and this has been considerably reduced by thermostatic operation.

Natural Draught System.

The natural draught system consists of the regulation of the air supply to the grate through the operation of the

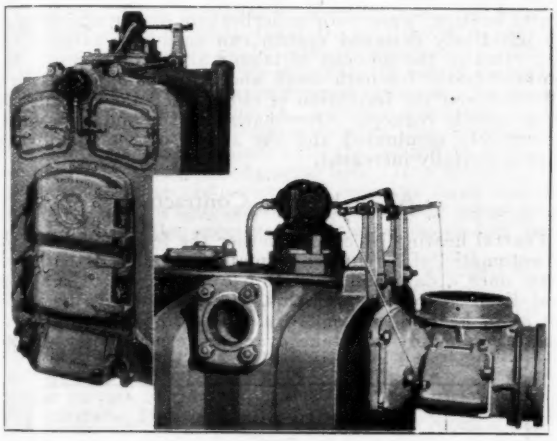


Fig. 1.—Thermostatic Damper Control Fitted to a Cast-Iron Sectional Boiler.

flue, check draught, and primary air dampers by means of a fractional horse-power motor. This motor, shown in fig. 1, is controlled by a room thermostat on an upper floor, and in addition a boiler thermostat is provided on the boiler flowpipe in order to limit the temperature to which the boiler may be raised. The boiler thermostat takes precedence over the room control, ensuring that the boiler temperature cannot in any circumstances exceed a figure consistent with safety. Any increase or decrease of the building temperature is communicated to the motor, which opens or shuts the dampers as required. As will be seen in fig. 2, a dual circuit is wired to the thermostats and the motor. When both thermostats are in a cold position the cold circuit is made and the motor is put into operation, thus opening the dampers. After half a revolution a switch fitted to the motor is automatically broken, and at the same time the second or hot circuit is made in the motor. The circuit is not completed, however, until one of the thermostats also makes a hot contact, and the motor is again put into operation and closes the dampers. At the end of the half revolution the circuit is broken and the cold circuit made, so that the cycle may be repeated.

The arrangement of thermostats is such that both thermostats must be in the cold position before the dampers can open, but either thermostat on the hot circuit is sufficient to close the dampers. A hand-control switch is wired also in conjunction with the thermostats to open or close the dampers at will, a provision, however, being made that if the boiler water temperature exceeds a given figure it is impossible to open the dampers. The thermostat is normally the bi-metallic strip type, the same as that on electrical and oil fired installations. The most delicate types may be used on coke boiler plant, and adjustments to within ± 1·5° F. can usually be made. Fig. 3 shows a typical temperature chart obtained on thermostatic control.

The Self-Acting Thermostat.

For small domestic boilers the dampers can be operated by a small self-acting thermostat placed in the flow-pipe,

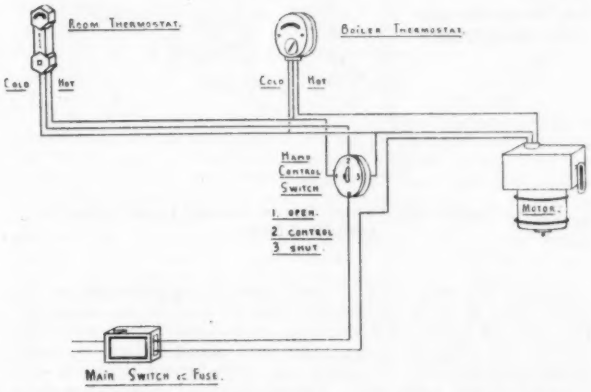


Fig. 2.—Wiring Diagram Showing the Circuit for the G.L.C.C. System of Automatic Damper Control for Coke Fired Boilers.

as shown in fig. 5, thus keeping the boiler water temperature constant. This thermostat may be of the metallic rod type, or an expanding liquid, or more usually of the pressure bellows type, depending for its action on the vapour pressure of a liquid of low boiling point, the pressure varying with small fluctuations in the temperature.

The power generated by these instruments is very high;

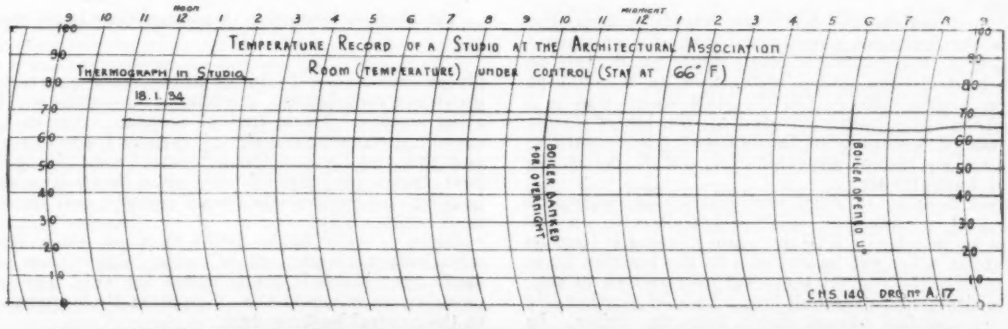

Temperature Record of a Studio at the Architectural Association
Thermograph in Studio
Room (temperature) under control (Stat at 66° F)
18.1.34
Boiler banked for overnight
Boiler opened up
CHS 180 Drg nr A.17

FIG. 3.—TEMPERATURE RECORD OF THERMOSTATIC CONTROL FITTED TO COKE FIRED BOILER.

but the movement is small, and the large magnification required greatly reduces their efficiency, satisfactory operation only being obtained when the installation is carefully balanced.

A newer type, recently introduced, is packed with paste having a very high co-efficient of expansion. These develop an extraordinarily high power, and have brought the fitment of controls within the range of the household boiler. They are powerful enough to overcome defects in damper fitment. One of their great advantages has been that boilers which previously gave trouble through burning out or extinguishing overnight can be maintained at low output for the whole period. Fairly accurate room control may be obtained by radiator or heating circuit valves operated by self-acting thermostats.

The Forced Draught System.

Where increased boiler output is desired or sudden demands are anticipated, forced draught is provided by means of a fan which is started and stopped by the room thermostat and boiler limit thermostat. The wiring is much more simplified, being a single circuit.

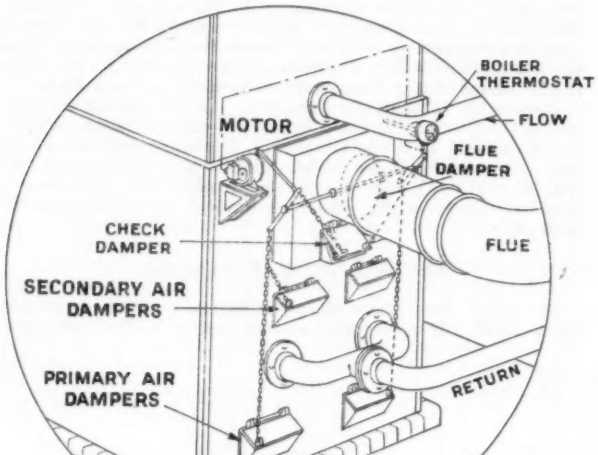


Fig. 4.—Thermostatic Damper Control Attached to the Back of a Coke Fired Boiler.

Forced draught control has a special application to the conversion of oil-fired installations to coke firing, as where the oil-fired boilers are working up to their fullest capacity it may be difficult to get the equivalent rating on coke firing with natural draught; but with forced draught this is quite easily achieved. Forced draught apparatus does not necessitate the use of special firebars for coke, an advantage held over certain types of small fuel now being supplied with proprietary makes of thermostatically controlled forced draught apparatus.

One disadvantage of forced draught equipment fitted to cast iron sectional boilers is that leaks occur between sections, so that a certain quantity of air is drawn in by natural draught even when the fan is shut down. This of course leads to a continued combustion of coke and to serious overheating when the boiler is on low load. Where the welded steel boiler is employed this disadvantage does not apply, and several such installations have been successfully equipped.

For combined heating and hot water supply systems the room thermostat operates a motorized magnetic or similar type of valve on the heating circuit, while an immersion thermostat controls the boiler water flow to a constant temperature, usually 160° or 180° F. Hot water supply is obtained through a calorifier, heated by the boiler water. This gives adequate control of the hot water temperature, which in practice remains approximately 10° F. below the boiler water temperature.

The central heating of combined systems is controlled by a motorized or magnetic valve either directly on the heating flow or in a by-pass to the main heating system so that cool return water can be mixed with the hot flow from the boiler to give the correct temperature required to supply the requisite heat to the building. In cold weather hot water will be supplied almost direct from the boiler. In mild weather the by-pass would be opened, and the greater part of the water circulated in the system would be relatively cool return water.

Various devices for mixing may be controlled by the thermostat or by a variostat, whereas motorized and magnetic valves in the water flow, or pressure operated valves are controlled by the room thermostat. This does not affect the principle of control of the coke-fired boiler by the boiler thermostat, as a diminution of the heat requirements of the building results in a tendency for the boiler water temperature to rise, resulting in operation of the boiler thermostat, and closing the boiler dampers.

Many types of thermostats and specialized equipment applicable to coke-fired boilers are being put forward by the manufacturers, and a later opportunity will be taken of surveying these to show their use in various circumstances.

Electric Current Failure.

The possibilities of the failure of the electric supply must definitely be taken into account, and, in view of this, small automatic damper releases are being developed to fit with the control gear. The dampers are held in position by means of a "Solenoid," electrically operated, which breaks as soon as the current fails, thus closing the dampers and eliminating all risk of overheating the boiler.

The fitment of thermostatic control to coke boilers has brought a great many advantages. Automatic control has meant a reduction in fuel consumption of 15%, and in some cases much more. It has increased the efficiency of the water heating, since both underheating and overheating of an effectively designed system can easily be avoided. A reduction of the amount of labour and attention—an important factor for both small and large boilers—has been effected, and the formation of clinker and boiler scale has been greatly reduced. Overheating of the boiler may now be entirely eliminated and the safety of the installation thus materially increased.

All-in Heating Contracts.

Central heating by coke, whether the feed or the control is automatic, still requires a small amount of attention at least once a day, and in certain cases the client may not feel disposed to give even this. It is possible to negotiate an all-in heating contract, by which the gas company or heating company will take over the responsibility of supplying heat to a building at a fixed quarterly charge, providing fuel, labour, attendance, maintenance, and every other service. To do this an accurate estimate of the fuel consumptions of buildings of various types must be made, and this has formed the subject of special studies of the heat losses of buildings during a heating season. The heating contracts might apply equally well to gas or coke fired boiler plants.

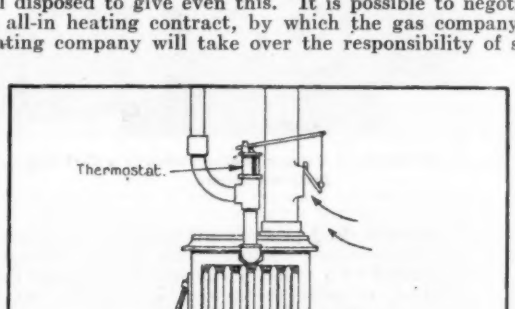


Fig. 5.—Small Self-Acting Thermostat Placed in the Flow-Pipe.

There is very little doubt that so much fuel is used wastefully through lack of proper supervision of building staff, that there is much scope for this type of service, ensuring as it would the efficient and adequate use of fuel in the central heating field.

Steam Condensing Plants

By H. C. Widlake, Assoc.M.Inst.Gas E., A.M.I.E.E., A.M.I.Mech.E., of the Plymouth and Stonehouse Gas Light and Coke Company

Except in the case of very large plants on which all operations are, of necessity, carried out on an extensive scale, the use of steam condensing plants on gas-works has been very limited. This circumstance was not due to any failure to appreciate the economic possibilities of such installations but rather to established local conditions which placed serious obstacles in the path of any proposed change of practice. To-day the position is very different, and the question as to whether condensing plant shall, or shall not, be laid down has become an actuarial, rather than an engineering, problem.

The principal factors to be considered when a condensing proposition is under review are:

(*a*) The cost of steam on the works.
(*b*) The load factor.
(*c*) The source of cooling water.
(*d*) Grouping of plant.
(*e*) Advantages.
(*f*) Capital outlay.

Cost of Steam.

If all the steam demands of a works could be met by waste-heat steam, costing (say) 1s. per ton, it is obvious that little justification could exist for capital expenditure in the pursuit of steam economies. It rarely happens, however, that the total steam demand can be met by waste-heat plant. In reviewing the possible economies to be secured by laying down steam condensing plant, the author accordingly proposes to deal with the subject in terms of reference to steam raised by solid fuel. It is assumed, for the purpose of the argument, that however large may be the saving effected by condensing, it can never be so great as to eliminate the necessity for keeping solid fuel fired boilers under steam.

The cost of steam raised by solid fuel is assumed to be 30d. per ton representing the fuel charge alone.

The Load Factor.

In the case of works generating plant, where the load is carefully built up with a view to making the most of the earning powers of the installation, load factors of 40% or 50% are quite usual. Plants used for the compression of gas for supply to remote districts offer rather poor load factors.

Blast fans, as used on water gas plants, offer a good load factor; they are always fairly heavily loaded and the hours of working are long. Such installations, in fairly regular use, may easily offer a 40%-50% load factor, and, particularly when turbine driven, are an attractive proposition from the condensing point of view.

Exhausters, whether driven by reciprocating engines or turbines, give a good load factor and are acceptable condensing propositions. Coal gas exhausters, however, should not be run into a condensing system, which, by reason of its use for other purposes, is erratic in the maintenance of vacuum. In this particular class of plant close automatic regulation of the " pull " may be of more value than the conservation of steam.

When a plant working under a poor load factor is sited close to a well-loaded plant the two installations may sometimes be run into a common condensing system, subject to the provision of adequate safeguards to ensure against an unfavourable incidence of loading. This point will be considered in a later portion of this contribution.

Source of Cooling Water.

The first essential to the maintenance of a good vacuum is an ample supply of cooling water, the quantity required depending upon the type of condensing plant installed.

In the cheapest form of condenser the water ratio (*i.e.*, the lbs. of water required for the condensation of 1 lb. of steam) may be as high as 60 or 70 if a good vacuum is required. In this connection it may be observed that it does not pay to budget for a higher vacuum than 26 in. Hg. in the case of reciprocating engines, as the areas of the exhaust ports and passages do not permit of a higher vacuum being profitably utilized.

When a natural supply of cooling water, such as a creek, a river, or a canal, lies within a reasonable distance of the load centre, the need for artificial cooling plant may not arise, and a substantial outlay may be avoided. Against this saving, however, must be set the cost of providing and maintaining inlets, screen chambers, outflows, and pipelines.

In some cases it may be found that the capital and running charges incurred in the utilization of a nearby source of water are prohibitive, and means for cooling and recirculating the same volume of water will have to be considered. For this purpose spray ponds, cooling frames, and cooling towers may be used, the choice depending upon the nature of the surroundings and the area available for the proposed artificial cooling plant. Spray ponds, or plates, are the cheapest to install. However, they not only occupy a large area but, under poor atmospheric conditions, may render the surrounding area unfit for profitable occupation.

Cooling frames are fairly cheap, take up relatively little space, and are efficient, but, if sited at ground level, may cause a nuisance in the immediate area. When conditions permit of their being placed on roofs or in well elevated positions, this objection is removed, and with some types of condensing plants a definite advantage is gained—*i.e.*, the elevation of the tank over which the frame is installed gives a natural head to the cooled water, and a condenser pump is not required.

Towers are extensively used for the cooling of large volumes of water. They take up very little space (2 sq. ft. per B.H.P. in the case of small plant), cost little to maintain, and discharge their vapour at such a height that it cannot possibly create a nuisance to neighbouring property. This is important in the case of a boundary sited plant. The loss of water by driftage is also much less than with both spray ponds and cooling frames.

Unless the quantity of water to be cooled is very small, or a particularly low final temperature is required, the natural draught tower is to be preferred on the grounds of first cost, simplicity, and economy in operation. Where space is limited or a very low final temperature is required, artificial draught towers may be used.

Grouping of Plant.

In so far as topographical conditions will permit it is customary to site as much running plant as possible under the same roof, to keep attendance charges low. For instance, electrical generating sets are often installed in the same engine room as the coal gas exhausters.

Another instance of grouping takes the form of generating plant and water gas blast fans in the same engine room. In this case it may be profitable to run both plants into a common condensing system rated to give a moderate vacuum at full load—*i.e.*, when the maximum demand of the blast fans is superimposed on the electrical peak. The latter demand may be of relatively short duration, and the purchase of a condensing plant rated to give a high vacuum on the combined maximum demands may not be a profitable investment.

When two different classes of plant are worked into a common condensing system there is always a danger of the combined maximum loads becoming an embarrassment from either the financial or the engineering point of view. This condition is shown in the graph, fig. 1, representing the individual and the combined steam loads of a works generating plant and a gas compressing plant respectively. It is assumed that these plants are sited adjacently and that the question of working them into a common condensing system is under examination. The incidence of the respective maxima of these loads is unfavourable in that the maximum demands of both plants prevail over the same relatively short period—*i.e.*, between the hours of 10 a.m. and noon.

The hatched portion of the top curve in fig. 1 shows the overload imposed on 8,000 lbs. per hour condensing plant by the combined maxima over peak hours. In this case it is preferable to run the compressor engines non-condensing during the 2 or 3 hours of peak demand, and to turn them into the common condensing system for the remainder of the 24 hours, when the combined demand will improve the load factor on the condenser without prejudice to the performance of the main engines.

The annual saving to be secured by working the compressing plant into the main condenser may amount to about £100, so it is well worth going to some trouble to arrange for the necessary interconnection and valving.

In all cases where some smaller plant is run into a main condensing system it is advisable to equip that plant with

automatic atmospheric valves, so that, by closing a hand-operated valve in the exhaust lines, the smaller units can be automatically thrown to atmosphere, leaving the condenser to handle the main load.

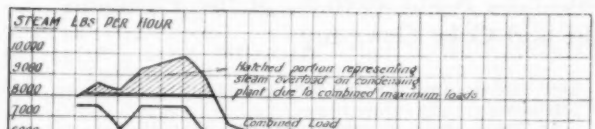


Fig. 1.

There is little to be said in favour of working small auxiliaries, such as boiler feed and (where used) air pumps into the main engine condenser. The small glands and exhaust lines of these small fry are a potential source of air leakages, which impair the vacuum and reduce the economic value of the installation as a whole. It is far better to lead these small exhausts into a heater for the purpose of raising the temperature of the boiler feed.

Advantages.

As an example of the savings to be obtained by laying down steam condensing plant, the following instance may be of interest. A gas-works power plant consisted of two 250 KW. and one 138 KW. generating sets, rated on a stop valve pressure of 90 lbs. per sq. in. The day load was carried by one of the larger units, and the night load by the small 138 KW. set. The annual output was in the neighbourhood of one million units and the load factor 40%. No facilities existed for ascertaining the steam consumption of these sets under non-condensing conditions, but a careful estimate based on their test plate performances (when new) gave an average steam figure of 48 lbs. per kilowatt hour.

Under condensing conditions the following performance was consistently obtained.

Steam Lbs. per KW. Hour.

Capacity of Set.	250 KW.			138 KW.		
Loading (%)	100	75	50	100	75	50
Steam lbs. per KW.-H.—						
Non-condensing . .	40	42·5	48	41	45	52
Condensing	26	28	32	27	28·5	33
Vacuum (in. Hg) . . .	21	21·5	23	25	25	25·5

It will be noted that the large set runs under a very poor vacuum; this is due to the worn condition of the low pressure valve and main line metallic glands which admit air and impair the vacuum. The smaller set is soft packed and invariably runs under a good vacuum.

The average net economy is, in this case, about 20%, representing an annual saving of about 5,000 tons of steam costing (at 30d. per ton) £625—a highly profitable return for an expenditure of £1,400.

Small turbines as used for the driving of blast fans and boosting plant offer a far better return for money spent on condensing plant than does a reciprocating job. These small machines are invariably extravagant when exhausted to atmosphere, and savings of 30%-40% net may be confidently anticipated.

Incidental Advantages.

Chief among the incidental advantages consequent upon the use of steam condensing plant ranks the prevention of the damage which large volumes of exhaust steam discharged into the atmosphere must cause to roofs and structures in the vicinity of the exhaust stacks. Take the case, for instance, of a holder in the vicinity of a large steam plant worked non-condensing. Large segmental areas of the holder plates are frequently wrapped in a dense cloud of drifting steam, and varying winds alternately remove and reinflict this visitation.

The plates will alternately dry off and be then enveloped in moist heat many times a day, a circumstance which is bound to be reflected in heavy painting costs and in the unduly rapid deterioration of the plates. Such conditions furnish a strong argument in favour of a condensing plant, apart altogether from the other more generally recognized advantages.

Where, in the absence of a natural source of cooling water, a tower is an essential feature of such an installation, a certain amount of vapour is discharged from that tower. This vapour, however, is discharged at a height of 70 or 80 ft. above ground level, it is relatively small in volume, and is quickly absorbed in the atmosphere near the point of exit.

Other incidental advantages following upon the installation of a condensing plant may take the form of

(*a*) A saving in firemen's wages due to the lower steam demand, and the possibility of being able to reduce the number of working boilers.

(*b*) The ability of the engines to carry their full rated load with a lower initial chest pressure. This is an important feature in the event of an irregularity in the works steam supply which tends to temporarily reduce the working pressure.

(*c*) Deferring the day when new boiler plant will have to be purchased, as the boilers, under the easier conditions of steaming, may be considered to have been given a longer lease of life.

Selection of Plant.

The chief considerations governing the selection of condensing plant are as follows:—

1. The source of cooling water.
2. Value attaching to the recovery of the condensate.
3. Power taken by auxiliaries.
4. Flexibility in regard to load factor.
5. Simplicity.

The Source of Cooling Water.—An ample supply of cold water which can, at all seasons of the year, be drawn from and returned to a nearby river or canal is a valuable asset always provided that the cost of pipelines, screens, &c., is not prohibitive. It has to be remembered, however, that unless a plant is very favourably situated in relation to such a source of water supply the capital expenditure involved in utilizing it and the power charges for pumping may both be much greater than would be incurred in the provision of cooling and re-circulating plant.

Value Attaching to the Recovery of Condensate.—Condensing plant falls under two main classifications, namely—

(*a*) Relatively expensive plant as represented by the surface and evaporative types in which the condensate does not mix with the circulating water, and is available for boiler feeding, and

(*b*) Comparatively cheap plant of the jet and ejector types in which the condensate mixes with the circulating water and is not recoverable.

Power taken by Auxiliaries.—Auxiliary plant operated in connection with condensers will comprise condenser pumps, circulating pumps, air pumps, or air ejectors, according to the type of condensing plant installed. The power taken by these auxiliaries will vary with the type of condenser and the source and temperature of the cooling water. Where water for this purpose cannot be drawn from a nearby river or canal it will be necessary to install plant for cooling and re-circulating the same body of water, and the re-cooled temperature of that water will be much higher than would be the case if it were possible to utilize a natural source. In order to maintain a given vacuum a larger volume of water will have to be kept in circulation, and the pumping power required will be proportionally higher.

The amount of water to be kept in circulation at full load will vary, depending upon the type of condenser and the temperature of the cooling water, from 30 to 60 times the weight of steam condensed, and the power taken by the auxiliaries from 3 to 5% of the total power developed by the main engine. The above figures do not apply to the evaporative type of condenser which, so far as concerns the quantity of cooling water required and the power taken by its auxiliaries, stands in a class by itself.

Flexibility in regard to Load Factor.—This characteristic is closely allied to the question of the power taken by auxiliary equipment. In some types of plant the power taken by the auxiliaries can be closely adjusted according to the load on the condenser, and such plants can be termed flexible in the best sense of the word, in that the power taken by the auxiliaries at, say, half load, may be little more than half that required at full load.

This is definitely a characteristic of the more expensive types of condensers and furnishes a strong argument in their favour when widely varying loads have to be handled by a single condenser. An average gas-works load, for instance, may be in the neighbourhood of 200 KW. between the hours of 7 a.m. and 3 p.m., falling to about 60 KW. during the evening and night hours. In the cheaper types of condensing plants it is not possible to adjust the auxiliary power proportionally with the load, so that in the instance

cited above the power required for running the auxiliaries (expressed as a percentage of the power developed by the main engine) might be in the neighbourhood of 5% at normal full load, rising to as much as 15% during the hours of light loading.

As the condenser is lightly loaded for two-thirds of the time it is obvious that any initial economy which may be secured by the purchase of a non-flexible type of plant must be largely offset by the characteristically higher operating costs.

Simplicity.—The value attaching to this characteristic depends, to a great extent, on the size of the plant. On large installations the engine attendants are generally men skilled in the running of steam plant and whose duties, moreover, are confined to the generating units. In the case of the small plant, not only are the attendants less highly skilled, but they often have duties other than the running of the generating units. In these circumstances it may pay to make certain sacrifices on the altar of simplicity.

Performance and simplicity, however, are not necessarily synonymous terms, and on large installations such concessions to the human element are not necessary, and performance rather than simplicity, should be the chief consideration.

Capital Outlay.

The total cost of installing condensing plant depends largely upon local conditions, such as the design of the existing exhaust main, the relative levels of the engine room and the sites selected for the condenser and the cooling plant, and the nature of the ground in which excavations may have to be carried out.

No two installations are alike in these respects and for this reason the figures given must be regarded as purely approximate.

The costs are based upon to-day's prices for the different units of plant, and where a natural source of condensing water is available it is assumed that the pumping lines necessary for its utilization are of moderate length. Where the water can be drawn from a nearby river or canal its temperature is naturally lower than that of water recirculated over some form of cooling apparatus, and the purchase price of the condenser and its pumps is correspondingly less.

Where cooling plant has to be used it is assumed that this will take the form of a natural draught tower sited near the engine room.

The cost figures are taken out for two distinct ratings—namely, a 6,000 lbs. per hour and a 2,000 lbs. per hour plant. The larger installation is suitable for, say, the electrical power plant on a works carbonizing about 80,000 tons per year and making a wide use of electricity for the operation of the various units of plant. The smaller plant is suitable for use in connection with a 70-80 B.H.P. turbine as used for the driving of water-gas plant blast fans.

These small units are naturally somewhat extravagant when exhausted to atmosphere and, subject to the gas plant load factor being reasonably high, offer an attractive proposition from the condensing point of view.

A 2,000 lbs. per hour plant would also be suitable for use in connection with a 60 KW. generating set; but with so small a set the load factor would have to be very high to justify the installation of condensing plant.

Under each rating two sets of costs are given, one for a river or canal side plant and the other for a case in which no natural source of cooling water is available.

Approximate Costs of Installing Steam Condensing Plant.

Capacity and Location	Type of Plant.			
	Surface Condenser.	Jet Condenser.	Ejector Condenser.	Evaporative Condenser.
	£	£	£	£
6,000 lbs. per hour river or canal side plant	810	650	570	1,780
6,000 lbs. per hour plant using cooling tower	1,210	1,050	970	1,780
2,000 lbs. per hour river or canal side plant	570	470	375	800
2,000 lbs. per hour plant using cooling tower	800	700	605	800

From the above figures it will be noted that the cost of installing a surface, jet, or ejector condenser is, roughly, 50% greater in the case of plant where a natural source of cooling water is not available. The cost of an evaporative condenser, on the other hand, remains unaffected by this condition. In so far as small and medium sized power plants are concerned, this type of apparatus stands in a class by itself, and a statement as to its characteristics is, at this point, desirable.

The evaporative condenser is essentially a type to be used in cases where the highest degree of ultimate economy is desired and where a good supply of condensing water at a suitable level cannot be provided.

Its outstanding advantages, by comparison with other types, lies in the exceptionally small amount of cooling water required for its operation. An evaporative condenser, fully loaded, requires only one gallon of water for every pound of steam condensed; under light loading this quantity can be proportionally reduced, and during the night hours it is often possible to shut down the circulating pump altogether, relying upon atmospheric cooling to maintain a good vacuum.

This extremely low water ratio, varying from 0 to 10 according to the load and the temperature of the air, is due to the fact that the condensation of the steam is largely brought about by the free circulation of air over the exterior surfaces of the pipes forming the condenser.

To secure the maximum cooling effect evaporative condensers are installed in an elevated position, a condition which partly accounts for the high initial cost of this type of plant.

The advantages of the evaporative condenser may be briefly summarized as follows:

(*a*) The low auxiliary power required.
(*b*) Low maintenance costs.
(*c*) Flexibility.
(*d*) Ease of extension.
(*e*) Safety.

Comparison of Cost.

In the case of a 6,000 lbs. per hour waterside power plant the cheapest type of condenser (so far as initial cost is concerned) would be the ejector condenser which could be installed for £570.

For this same duty an evaporative condenser would cost £1,780, or just over three times the price of the cheapest alternative.

For the purpose of comparison it is assumed that the maximum demand is 200 KW., the load factor 40%, and the stop valve pressure 100 lbs. per sq. in. (gauge).

Under these conditions the annual output would be about 700,000 units and the steam consumption per unit generated with the engines exhausting to atmosphere about 48 lbs. per unit. With steam at 30d. per ton the annual cost of running this plant would be £1,875.

Assuming the auxiliaries to be electrically driven, an ejector condenser supplied under a head of 20 ft. with water pumped from a nearby source would require about 70,000 units per year, increasing the output of the plant to 770,000 units.

Under the stated conditions of loading and steam pressure a gross saving of 30% due to condensing might reasonably be expected.

The cost of steam under these new conditions would be £1,444 per year, showing a saving of £431 (net) as the result of installing a condensing plant. The cost of maintaining the condensing plant is, of course, a charge against this saving, but this is a small matter and does not affect the main argument.

If, instead of an ejector condenser, an evaporative condenser were installed for this duty the power taken by its auxiliaries would be considerably less, probably in the neighbourhood of 30,000 units per annum, the output of the plant would be 730,000 units, and the annual cost of steam £1,370. The net saving in this case would be £505, due to the superior performance of the evaporative condenser by comparison with the cheaper ejector type.

The evaporative condenser offers a saving of £74 a year more than that which can be secured by the use of its cheaper rival. It costs, however, £1,210 more to install, so that the increased capital charges more than offset any saving which, by virtue of its superior performance, it is certainly capable of bringing about.

In this case the fact that the plant is conveniently situated in relation to a source of condensing water establishes a firm case in favour of the cheapest type of plant, and an ejector condenser is the most economical proposition.

When a plant is not so fortunately situated and the condensing water has to be kept in circulation over some form of artificial cooling apparatus, a strong case can be made for the installation of the more expensive type of condensing plant as the following figures will show.

The cost of an ejector condenser with cooling tower and the necessary pumps for a steam duty of 6,000 lbs. per hour is £970, or a little over half the cost of an evaporative condenser (£1,780).

The current required for the operation of the condenser and cooling pumps will amount to about 100,000 units per

year and the annual output of the generating plant under the stated conditions of loading will be 800,000 units. With steam at 30d. per ton and under condensing conditions the fuel cost will be £1,500 per annum.

When exhausting to atmosphere and generating 700,000 units per year the annual steam charge was £1,875, so that the net saving effected by installing an ejector condenser and cooling tower will be £375.

An evaporative condenser handling this same duty will, as already shown, effect a net saving of £505 per annum as against the £375 secured by the use of the cheaper ejector type. It is true that it costs £810 more to install, but this additional sum capitalized at even 8% represents an added annual charge of only £65 as against a saving of £130.

The fact that an evaporative condenser costs much less to maintain than does an ejector condenser and cooling tower is an added argument in favour of the more expensive type of plant, although, from the actuarial point of view, the case needs no bolstering up.

The value attaching to ground space is, of course, a purely local consideration, but it must not be forgotten that, whereas an evaporative condenser is installed in an elevated position and the space under it profitably utilized, a cooling tower for a 6,000 lbs. per hour duty will require about 600 sq. ft. of land.

The conclusion to be drawn from the foregoing figures is that in the case of a waterside plant the inexpensive ejector condenser is by far the best proposition.

Where the engines are not favourably situated in relation to a natural source of cooling water, the auxiliary power charges incurred in the working of a condensing plant must naturally be much greater, due to the necessity for pumping the water over cooling apparatus, while the cost of an evaporative condenser is less than 50% greater than that of the ejector installation.

The author desires to express his thanks to Mr. R. J. H. Clark, M.Inst.Gas E., the Chief Engineer of the Plymouth and Stonehouse Gas Light and Coke Company, by whose courteous permission particulars of the plant on the above works are published in this article.

"On Home Service"

American *v.* English Methods

By Eileen Murphy

"Tell me about your Home Service activities," said an American woman expert to me recently.

I gave her some introductions, and hoped for the best. Her report, when it was published in an American gas journal, was a complete vindication of British methods. After describing some of the things she saw, she added: "They hardly consider all this worthy of the great American appellation—'Home Service.' I sometimes wonder what they think we have over here!"

I have now read the discussion in which an English gas engineer, who visited America with the Institution party last year, eulogized American Home Service in these words: "There is a whole host of specialist women there, of whom there is no counterpart in this country, where we consider that a demonstration of cooking is the beginning and end of all that sort of work."

These statements—the American home expert's and the English engineer's—neatly cancel each other!

I hope to go to America myself in the near future, but in the meantime I am following the railway companies' injunction to "see England first." In the last few weeks I have been able to see something of the Home Service methods used by individual undertakings near London.

Home Service as it is understood in America includes cookery demonstrations and showroom lectures; a free consulting service for domestic problems, and particularly for kitchen-planning; after-sale service to make customers expert in the use of their gas appliances; and close contact with influential classes (such as doctors, builders, and teachers), with women's clubs and societies, and with the local branches of national welfare organizations.

I have tried to find out how far our English practice tallies with the American programme. For the purposes of this article I am taking the Croydon Gas Company as my example; in future numbers of the "JOURNAL" I hope, with managers' acquiescence, to describe the activities of other undertakings.

The women's staff at Croydon includes qualified demonstrators and saleswomen. The demonstrators visit the homes of consumers to show how to use cookers to the best advantage and to investigate complaints.

All new cooker installations are followed up. Sometimes there may be delay in doing this, but if a consumer should need immediate assistance she has only to post to the Company a card which has been left for the purpose when her cooker was installed. A demonstrator will then call on her at once.

Cookery demonstrations and lectures are given throughout the winter months in the Company's own special lecture halls, of which there are three. These are afternoon weekly lectures. They are advertised and invitation cards are sent out. Tea is served. Demonstrations given in the Company's lecture halls are not confined to cooking; on certain occasions demonstrations of laundering, refrigeration, &c., are given.

Demonstrations of cooking, laundry work, and refrigeration are also given in the sales showrooms, of which there are eight. Usually, these are silent, being staged in or near a window. Interested people from outside and visitors to the showrooms may question the demonstrator if they wish to do so. These demonstrations are more or less continuous in one or other of the showrooms. The use of appliances is demonstrated wherever possible, as being more interesting and of better sales value, because when audiences see the appliances in use, it is not necessary to overstress the gas propaganda. Systematic contact is made with practically every women's organization in the company's area of supply. A note is made of every hall in the area, and it is found what meetings are held at the halls. Then the company's representative gets into touch with the various secretaries. In this way she covers everyone: Townswomen's Guilds, Women's Institutes, Women's Co-operative Societies, Women's Section of the British Legion, Railwaymen's Guilds, &c. Copies of "The Flambeau" are presented to the women's organizations.

If organizations have no meeting halls, they are invited to the Company's halls and seats are reserved for them.

Girl Guides who are training for their "Cookery Badge" are encouraged in this way. The Gas Company loans a hall and cookers for their final examination.

A further instance of this work is the attention which is paid to the Mothers' Union. This is a Church organization, and contact is made through the vicar or his wife, the latter being usually the secretary or treasurer of the local branch.

Another interesting contact is with the Medical Officer of Health. At his request, demonstrations are given to working-class women, showing how to use the gas ring to cook nutritious meals for the minimum expenditure.

Talks are given on all kinds of topical subjects. For instance, when the newspapers held an inquest into the nutritive value of various types of food, the opportunity was taken to give a lecture on "Food Fallacies," which drew a crowded and appreciative audience of women.

The women's staff are always available to give advice to consumers on any domestic problem, to recommend recipes for parties, and so on.

The Company contemplates the installation at the showrooms of model kitchens, designed to help consumers with their own kitchen-planning problems. This will undoubtedly be a valuable step in a rapidly growing residential district like Croydon, where new houses are going up almost overnight.

This is a brief uncritical catalogue of the activities of the women's staff in a single English undertaking. Making due allowance for inevitable differences in national psychology, outlook, and habits, it will be seen that there are many points of similarity between the American and British systems. There is, however, one essential difference. The Americans do not make a virtue of modesty. They *very rightly* believe in reminding their consumers at every possible opportunity of the advantages of the Home Service which is provided in their interest. They give an official status to their Home Service employees. They advertise the benefits of Home Service. They capitalize their own enterprise instead of masking it from the light. Why should not English undertakings do the same?

A Technical Signpost to the "JOURNAL."

Vol. 206, April to June, 1934

GENERAL.

The fact that American and Canadian practice in regard to gas production differs from that in this country is largely attributable to the extensive use of natural gas (p. 546). Thus in Canada, approximately 30,000 million c.ft. of manufactured gas are produced as compared with 26,000 million c.ft. of natural gas. In regard to the United States, the total volume of manufactured gas is given as about 360,000 million c.ft. as compared with 30,000 million c.ft. of natural gas. Natural gas is, however, supplied in large quantities to industrial consumers, the average consumption per consumer being 165,979 c.ft. as compared with 38,493 c.ft. for manufactured gas. The use of natural gas has developed in a somewhat irrational manner, and there is little co-ordination with the producers of manufactured gas. In fact, the two suppliers are virtually regarded as separate industries. In Chicago, the gas supplied consists of 45% of natural gas (calorific value about 1,000 B.Th.U.), the calorific value of the mixed gas being about 800 B.Th.U. A certain amount of natural gas is sold compressed in cylinders, this gas consisting largely of propane, as butane is unsuitable owing to its low volatility. The manufactured gas is obtained mainly from coke ovens and water gas sets. Thus in 1932:

—	Gas Made.	Gas Purchased.
Water gas	172,000	..
Coke oven gas	49,000	92,400
Coal gas	32,000	..
Natural gas	..	30,000

Approximate figures in million c.ft.

Calorific values vary greatly in the different localities and are, in general, higher than in this country. The demand for coke is good, which fact is evidenced by the large proportion of coke oven gas which is manufactured.

The question of the supply of coke oven gas for distribution together with coal gas, either in small units or in a large grid, has formed the subject of innumerable papers and discussions by the various bodies interested in the problem (p. 457). It is now fairly clear that only in special areas can such a scheme be successful, an example in point being the South Yorkshire Grid. On the other hand, it has been demonstrated that the erection of coke ovens at the steel works rather than at the pithead will allow the utilization of the greater part of the surplus coke oven gas and this would appear a more rational development except in areas where there are a number of coke ovens and a large industrial consumption of coal gas. The Cleveland area is suggested as being suitable for a grid scheme, but here again the proximity of steel plants might well absorb much of the surplus gas. From the standpoint of the Gas Industry the erection of new ovens based on an outlet for their gas would most probably result in production of domestic coke competing directly with gas coke. It is significant that coke oven manufacturers are now considering the erection of ovens specially designed for this purpose.

The results of running a 24-H.P. lorry on compressed coal gas for a year are now to hand from the Rotherham Gas Department, and clearly indicate that there is a definite limit to the application of compressed gas for this purpose (p. 39). The cost of conversion of the lorry and supply of cylinders is given as £110 9s. 1d., which, being depreciated over the authorized period of five years, gives an annual charge of £24 4s. 4d. The saving of fuel as compared with petrol is given as £27 13s. 7d. for the 10,008 miles covered in the year. Against this must be debited the depreciation charge of £27 4s. 4d. *plus* the extra tax of £5 making a loss of £4 11s. 3d. per annum. It is clear that a greater mileage must be run by a lorry of this size in order that economy can be secured by the use of coal gas. This limiting mileage was also pointed out by Dr. Walter in a recent discussion (p. 200), who in addition drew attention to the disadvantage that solid tyred vehicles are taxed on weight. Thus, if a vehicle is taxed at £66 per annum when running on petrol, the tax would be increased to £93 per annum when using coal gas. Similarly the maximum unloaded weight of an omnibus is limited to 10 tons, so that passengers must be sacrificed to allow the carrying of gas cylinders. Some modification in legislation is required before the two fuels could be fairly compared on a commercial basis.

A useful summary of the steam and power requirements of a gas-works is obtained from a paper by Birks (p. 210). For a number of modern works the consumption of steam (from and at 212° F.) varied from 81 to 101 lbs. per 1,000 c.ft. or 1,220 to 1,930 lbs. per ton of coal. In each case the manufacture of sulphate of ammonia is excluded. For the steam available from waste-heat boilers a round figure of 1,300 lbs. per ton is given, this relating to continuous vertical retorts without regenerators. Comparative figures for the power consumption of several of the works of the Gas Light and Coke Company are most instructive.

Works.	Carbonizing Plant.	Kilowatt Hours per 1,000 C.Ft. of Gas.	Steam per 1,000 C.Ft. of Gas. (Lbs.)	% Waste Heat Steam.	Total Cost of Electricity and Steam. Pence per 1,000 C.Ft.
A.	Horizontal retorts and coke ovens	0·619	101	55	0·64
B.	Horizontal retorts and C.W.G.	0·276	94	53	0·63
C.	Continuous vertical retorts and C.W.G.	0·358	98	94	0·38
D.	Intermittent chambers	0·535	81	39	0·76

The average cost of current as generated at the twelve works of the above Company is given as 0·25d. per unit. The use of live steam for exhausters, feed pumps, &c., is recommended and exhaust steam for all process work. Where low-pressure steam is required, steam economizers are of value in permitting an economical reduction from high to low pressure supplies.

According to a recent German investigation (p. 444) the production of alcohol from ethylene via the formation of ethylene sulphate can be accelerated by the use of certain catalysts and also by carrying out the absorption of the ethylene in sulphuric acid under pressure. Optimum results are obtained with a pressure of 15 atmospheres and a temperature of about 70° C.

CARBONIZATION.

The review of Canadian and American carbonizing practice presented to the Institution of Gas Engineers by Carr contains a number of interesting points (p. 546). While a large proportion of the gas manufactured in these countries is derived from coke ovens, continuous vertical retorts are used on a number of works. Enrichment is obtained by spraying gas oil into the tops of the retorts, the richer gas obtained allowing heavier steaming to be practised. A variety of different types of ovens are employed, and in some cases they are heated by a mixture of producer gas and natural gas or propane air mixtures and coal gas. Coke dust appears to be a troublesome factor, and special water sprays and vacuum ducts over the coke-quenching cars are employed. At Toronto the coke is sprayed with a solution of calcium chloride to retain a certain amount of moisture, and this method is apparently now being widely adopted. Presumably the hot and dry summers in these countries necessitates such treatment.

The possibility of increasing the throughput of continuous vertical retorts is illustrated by the changes in carbonizing practice at Birmingham (p. 203). The settings of vertical retorts were originally designed for working without steam, each retort having a daily throughput of about 5 tons of coal. With the introduction of steam it was necessary to reduce the throughput partly owing to insufficient producer capacity. Subsequently, larger producers were installed, and the higher flue temperatures thus obtained allowed a considerable increase in throughput, although, to accommodate the larger producers, it was necessary to remove the regenerators. Throughputs of 8-9 tons per day are now being obtained, and, while no actual figures are given, it is stated that the fuel consumption per ton of coal has been appreciably reduced. Another advantage of the higher working temperature is the increased cracking which takes place resulting in higher yields of gaseous therms—viz.:

Tons of coal per day	5·02	..	6·05
Therms per ton	74·30	..	77·6
Calorific value (B.Th.U.)	475	..	477

It is stated that the coke has also improved and in particular has a more open texture.

Of recurring interest is the possibility of increasing the gas yield from horizontal retorts by steaming. Experiments at the Fuel Research Station have shown that a strictly limited degree of steaming is possible giving a small increase in the yield of therms per ton. At Cardiff, steam has been passed over the charge in lightly charged horizontal retorts, apparently in the hope that the cracking of the gas and tar vapours which takes place in the free space above the charge would be reduced (p. 451). Since actual gas yields could not be obtained, the effect of the introduction of the steam was to be gauged by the change, if any, in the composition of the gas and tar produced. From the results obtained it would appear that the only difference worth noting is that the percentage of free carbon in the tar is abnormally high (18-26%), indicating much greater cracking than is normally obtained in the modern horizontal retort. Any effect of the steam is thus more than negatived by the fact that the whole of the gas was taken away from one end of the retort and the correspondingly longer time of contact of the vapours with the hot surfaces. An increased gas yield of some 1,400 c.ft. per ton was obtained, due, presumably, to water gas formation, which would correspond to a decomposition of about half the steam supplied. A reduction of scurfing was anticipated, but this was not possible since there was excessive scurf formation at one end only of the retort.

Some details have been published regarding the results obtained at Bath by carbonizing Somerset coal in horizontal retorts (p. 265). Thus, from coals the ash content of which varied from 7·8% to 10·3%, the therm yield per ton varied from 66·3 to 72·12 at a calorific value of 501-533 B.Th.U. The coking power of the coal is not very high, as about 20% of breeze is produced.

An interesting account of the conditions encountered on taking over various small undertakings by the British Gas Light Company is given by Parkinson (p. 575). In general, the size of the undertakings has not justified completely new plant, and in most cases the original plant has been altered, repaired, or in parts re-constructed. Inadequate bracing of settings, resulting in hydraulic mains, &c., being out of level appears to be a frequent trouble, and in some cases where renewal was not possible the installation of Arca automatic vacuum control allowed the seal to be dispensed with and a satisfactory and uniform vacuum to be maintained. At Baldock (annual output 17 million c.ft.) it was necessary to erect new settings to meet the local conditions—only one man being available for the working of the retorts—and a setting of inclined retorts was adopted. Using Wombwell Main coal a yield of 75 therms per ton with a calorific value of 480 B.Th.U. was obtained from these retorts. At King's Lynn (105 million c.ft.) the existing plant was replaced by horizontal retorts with Congdon descension pipes, the gas being diluted from 570/590 B.Th.U. to 500 B.Th.U. by the addition of blue water gas. At the same time the fuel consumption was reduced from 20% to 14%. At Westgate-on-Sea, Jenkins-Klönne intermittent vertical chambers were installed, from which a gas yield of 75 to 84 therms per ton with a calorific value of 500 B.Th.U. is being obtained, while the coke and breeze made for sale total 10·75 cwt. per ton of coal.

Some interesting features are incorporated in the newly remodelled works at Mossley (p. 468). Different coals from stock can be blended by feeding via steel chutes to a rotary feed table, the angle of the chutes being adjustable so as to allow varying proportions of each coal to be mixed. After careful examination of different types of retorts, it was decided to erect horizontal retorts and Drakes regenerator settings were adopted. For coke quenching and handling from the retort houses the Fleuve system has been installed. The coke and water are discharged from the water conduit on to ½ in. mesh screens which are inclined at 30°. The water and fine breeze are thus separated from the coke, which passes to a storage hopper, the fine breeze being allowed to settle from the water in a series of settling tanks, after which the water is recirculated. No details of the results obtained are however given.

The Fleuve system has also been adopted for the recently reconstructed works at Stockton (p. 323). In this plant a steel shaft is fitted to remove the steam from the quenching trough, from which the coke and water are discharged on to a perforated plate conveyor. The water and breeze are subsequently separated in settling troughs, and the water finally passes through ½ in. mesh screens where the residual breeze is recovered and dried, the water being re-circulated. The newly constructed carbonizing plant at this works consists of four beds of 10 retorts 18 in. by 24 in. by 23 ft. long. The retorts themselves are segmental and constructed with Consett silica material. Considerable attention was given to the provision of an adequate allowance for the expansion in these settings, this being based on the makers' figure of 1·5%. In regard to upward expansion, each retort was set ¼ in. low, making a total of 1¼ in. for the five retorts. For the longitudinal expansion of the retorts, a space of ⅜ in. was left between the fireclay mouthpiece and the cast iron sleeve, while two ⅜ in. cardboard strips were inserted to allow for lateral expansion. Careful measurement of the actual expansion on heating up the retorts gave a value of 1·3% as compared with the specified figure of 1·5%.

A problem which has now been before the Gas Industry for many years is the manufacture of a coke suitable for combustion in the ordinary domestic grate. At the moment two distinct types of fuel are marketed—a true high-temperature coke for the combustion of which a specially designed coke grate is required, and a true low-temperature coke which is suitable for any ordinary grate. By careful selection and blending of coals, however, it is possible to obtain a high-temperature coke which falls into an intermediate position and can in some cases be claimed as a satisfactory fuel for any domestic grate. An example of this is the fuel sold by the Liverpool Gas Company under the name of "Dryco." On the other hand, simple low-temperature carbonization has not shown itself to be so commercially successful as to encourage its development—in whatever form—by the Gas Industry.

Two possible methods for the manufacture of a medium-temperature coke have been investigated on a large scale at the Fuel Research Station (p. 603). The continuous vertical firebrick retort, which has been developed in recent years at the Fuel Research Station, has already been described, and satisfactory operation at a temperature of about 700° C. is claimed with a variety of coals and blends; but as noted in a previous review no data of an economic nature has yet been vouchsafed. The second series of experiments consist in the carbonization of various blends of coal in a standard "W.-D." intermittent chamber oven at temperatures of 650-850° C. The advantage of this static carbonization is the production of a denser and stronger fuel, but the time of carbonization is greatly prolonged. Thus, with temperatures of 850° C. in the bottom flues and 650° C. in the top, the carbonizing period was about 20 hours, whereas, under normal high-temperature conditions this would have been 10-12 hours. It is well known that the time required can be considerably reduced if the thickness of the charge is decreased, and results are given illustrating this difference:

—	Mean Width of Ovens. (In.)	Carbonization Period. (Hours.)	Rate of Carbonization. (In. per Min.)
Chamber ovens	11	20	0·55
Silica ovens	9½	10	0·95
" "	6½	6	1·00

From these results it would appear that the ordinary high-temperature oven is not suitable for the medium-temperature process, and that reduction in width is necessary. The following figures are illustrative of the yields obtained in the Fuel Research Board's experiments:

Coal.	Silkstone.	High Delf (Forest of Dean).
Yield (therms per ton)	57·5	33·3
Tar (galls. per ton)	19·1	14·4
Coke (cwt. per ton)	13·92	13·48
Breeze (½ in.) (%)	16·50	15·20

It will be noted that, despite the static charge and harder coke produced, there is still a large production of breeze. The cokes obtained from various blends of coking and non-coking coals or coke breeze were carefully examined particularly with regard to their suitability for domestic purposes. Comparison is made between the coke made in the vertical brick retort (which may be regarded as a suitable fuel for an ordinary grate) and the chamber coke. The latter is considerably harder, the bulk density being 29 lbs./c.ft. as compared with 20 lbs./c.ft., and it has a somewhat greater resistance to shock and abrasion as shown by the results of shatter and rumbler tests. While the retort coke is more easily ignited, the oven product is sufficiently free burning for general purposes. The blending of non-coking coal increases the combustibility, although the maximum rate of radiation attained is unaffected. Blending with breeze, however, increased the maximum rate of radiation. These comparative tests were only carried out with one coking and non-coking coal and with coke breeze.

In regard to the blending of coking and non-coking coals a plant has been erected in the Saar valley for the carbonization of blends of Saar coal and low-temperature breeze (p. 255). The low-temperature breeze is made by the carbonization of non-coking Saar coal in a two-stage process in which the coal is first dried and then carbonized in the Salerni retort. Five of these retorts have been

erected, each capable of carbonizing 30-32 tons per day. The gas yield is given as 1,430 c.ft., with a calorific value of 815 B.Th.U. The resulting coke is apparentely an improvement on that obtained from the unblended coking coal; but the success of the process will probably depend upon the markets available for the disposal of the low-temperature products.

From Brighouse are reported experiments in which various blends of coal were carbonized in an endeavour to produce a coke suitable for an ordinary domestic grate and also, apparently, to reduce the carbonization period (p. 96). When carbonizing a blend of 50% coking and 50% non-coking coal it is claimed that a "normal coke" is produced, and the carbonizing period is reduced from 12 to 8 hours. Unfortunately, no details are given of the flue temperatures, volatile content of the coke, &c., in support of this statement.

WATER GAS.

The manufacture of water gas has been developed in the United States and in Canada to a greater extent than in this country, since it constitutes in many cases the only alternative should the supply of natural gas fail, while it is also necessary for meeting peak loads (p. 546). Apart from automatic valve control, which is widely adopted, automatic temperature control is now being applied, and greater use is made of recording instruments than is the case in this country. Owing to the use of oven coke, somewhat higher blast pressures are used. Heavy bunker oils are being used in place of gas oil, these oils being sprayed into the top of the generator on the down run, producing a gas of lower CO content and specific gravity, and a greater tar yield. One of the current problems is to make a carburetted water gas suitable for direct replacement of the high calorific value coal gas-natural gas mixtures. The calorific value required may be as high as 800-1,000 B.Th.U., and up to the present it is doubtful whether satisfactory technique for the production of such gas has been developed. Another modification which is being investigated is the cracking of natural gas by passage, during the run, through the generator and subsequent plant, or alternatively through the carburettor alone, according to the degree of cracking required.

REFRACTORY MATERIALS.

From further research on the permeability of refractory materials the following points may be noted (p. 465):

1. The permeability of fireclay products to air increases progressively in three types of material representing the green to the finished product fired at 1,200° C.
2. The result of firing over this range is to decrease the number of pores but to increase their average size.
3. Continuous vitrification up to 1,400° C. does not show a constant decrease in permeability as might be anticipated.

PURIFICATION.

A description of American methods of condensation and purification contains several points of interest (p. 546). In the design of water-cooled condensers it is arranged that the area of the gas passages is reduced proportionally to the temperature of the gas. A fairly constant gas velocity is thus secured and a higher average rate of cooling. At Philadelphia the condensers are combined with a refrigerating plant, in order to cool the gas to about 40° F., this being necessary for the removal of some of the gum-forming constituents from the gas. For carburetted water gas, washer-coolers are generally employed in which the gas is cooled by sprays of water. Electrical precipitation of tar appears to be much more widely used than in this country and is undoubtedly the most efficient method of obtaining a really clean gas.

While oxide purification is the general practice for the extraction of hydrogen sulphide, the Koppers process of removal by alkaline solvents is used in a number of works. The earlier process of washing by soda solution is being replaced by the newer Thylox process in which the gas is washed by a solution of sodium thioarsenate. An extraction of 99% of the hydrogen sulphide is claimed and about 90% of the hydrocyanic acid, the final traces of these impurities being removed by oxide purifiers. It is noted that special care is taken in blowing off oxide purifiers, and for this purpose the free space is flushed out with waste gas. In some cases, concentrated ammonia is made, and the gas scrubbed with this liquor to remove some of the hydrogen sulphide. The resulting solution of ammonium sulphide is then sprayed into the hot producer gas and thereby destroyed. It is stated that the hydrogen sulphide content of the gas is thus reduced to 90-120 grains/100 c.ft.

Investigation into the possible methods for the removal of the gum-forming constituents from town gas is being actively pursued in America, and a technically satisfactory process has now been developed (p. 207). It will be recalled that the outstanding problem is the prevention of the formation of vapour phase gums caused by the interaction of minute traces of nitric oxide in the gas with certain unsaturated hydrocarbons. To prevent this gum formation complete or partial removal of the nitric oxide has been attempted. In the first place, it has been necessary to develop a quantitative test for the nitric oxide present in the gas, and it is now claimed that a satisfactory test is available. Tests have shown that the nitric oxide content of gas from horizontal retorts varies considerably from hour to hour—*i.e.*, from 5 to 30 grains per million c.ft. In carburetted water gas manufacture the gases are rich in nitric oxide and from 40-70 grains per million c.ft. are found in the run gases. By a modification of the method of working the purifiers it is claimed that the majority of the nitric oxide can be removed, but no details are published concerning the process.

Whereas carburetted water gas can be completely freed from nitric oxide in this way it has only been possible to reduce the nitric oxide in coke oven gas to about 2 grains per million c.ft. It is also found that in some cases nitric oxide is lost on storage in the holders to an extent depending upon the temperature and oxygen content of the gas. Contrary to earlier conclusions, it is now found that unless the nitric oxide is completely removed, gum formation will take place even when only one or two grains per million c.ft. remain. In this connection it is important to determine whether any stoppage in the distribution is due to vapour phase or liquid phase gums, and a very delicate test for making this differentiation has now been developed. It is interesting to note that where the quantity of vapour phase gum necessary to cause a stoppage is always microscopic—*i.e.*, 0·00005 grain—something like 0·1 grain of liquid phase gum is required.

COKE.

In regard to the handling and quenching of coke some details have already been noted under "Carbonization" of two installations of the Fleuve system. At Wandsworth a new screening plant has been recently erected which is capable of treating 30 tons per hour (p. 83). The plant, which is entirely constructed in reinforced concrete, is comprised of receiving hoppers of 100 tons total capacity, from which the coke is fed to the screening units by a band conveyor. By preliminary screening, the coke over 1½ in. is removed, the undersize being separated into two sizes—breeze under ¾ in. and ¾ in.-1½ in. The breeze is fed to the boilers and the larger size to the mechanical grate producers, while the oversize is re-screened, the material over 2 in. being sent to the breakers. It is noted that vibrating screens are employed throughout, various types of the Pegson single-deck screens being used. To minimize the breakage of the coke, spiral lowering chutes have been provided in the storage compartments of the two largest grades of coke, and de-breezing screens are fitted at the discharge of the various hoppers.

In a discussion at a meeting of the newly formed coke salesmen circle, it was stated that in a certain area 84% of the coke fires supplied represented new business and only 16% could be regarded as replacement of gas fires (p. 319). The question of standardization of coke sizes still remains unsatisfactory, and as an alternative to the sizes proposed by the London Coke Committee a more closely graded series has been suggested (p. 311). This has the advantage that it will reduce the tendency to produce grades intermediate between those specified by the Coke Committee; but, on the other hand, it will necessitate a very careful grading and de-breezing if satisfactory results are to be secured.

The annual report of the Midland Coke Committee which has been recently issued contains several points of interest (p. 148). Although much has been claimed for the value of laboratory blending experiments, it is now stated that the effect of blending different coals on the resultant coke cannot be predicted from the laboratory experiments. The swelling power of a coal has some relationship to the carbon and hydrogen contents of the coal, and hence the ultimate analysis of the coal can afford some idea of the coking properties. A property of good coking coals is that they are able to retain the oil liquated from the coal itself up to a temperature of about 420° C. It might hence be anticipated that by the addition of oil the coking properties of feebly coking coals might be increased, and laboratory experiments have shown this to be the case for a number of coals.

BENZOLE EXTRACTION.

The methods employed by the Newcastle-upon-Tyne and Gateshead Gas Company for the removal of benzole from gas, and its subsequent rectification, are discussed in a comprehensive paper by Wikner and Richardson (p. 559). Using 115 galls. of wash oil per ton of coal, a yield of 2·46 galls. of crude benzole is obtained, this being equivalent to

89·8% of the extractable spirit in the gas. Gas oil is used for washing, this being preferred to creosote as it has less tendency to thicken on use. No serious deterioration of the gas oil has taken place after washing for twelve months, and there is no deposition of sludge in the oil coolers. These facts point to efficient washing and tar removal from the gas prior to the benzole plant. The removal of naphthalene is effected by passing the gas through a separate washer placed prior to the benzole washer. In regard to the removal of the organic sulphur compounds in the gas, a reduction of 45% is claimed—*i.e.*, from 22 to 12 grains per 100 c.ft.—this purification being obtained when using 8-9 gallons of oil per 1,000 c.ft. and extracting 90% of the benzole. The working cost of extraction is given as 3·96d. per gallon, which, deducted from the revenue of 11d. per gallon, leaves a net profit of 7d. per gallon. From this figure there must, of course, be deducted the value equivalent to the therms removed from the gas.

The composition of the benzole extracted is shown to vary considerably according to the carbonizing conditions maintained in the retorts, which are in this case horizontal. The effect of different cracking conditions is essentially to alter the paraffin content—which varied between the limits of 1·5% and 6·3% in the spirit obtained from three different horizontal plants. The sulphur and specific gravity varied inversely as the paraffins. None of these crude benzoles after acid washing conformed, *per se*, with the National Benzole specification, but when mixed gave a suitable spirit.

For rectification, acid washing and later the inhibitor process have been employed. In the acid washing process no preliminary distillation is required, but the spirit is given a wash with 1½% of B.O.V. and then with 1½% of C.O.V. These are followed by two water washes and an alkali wash. The final rectification is effected by distillation in a column packed with Lessing rings which are stated to give a very effective fractionation. The average loss on acid washing is given as about 4%. In the case of the inhibitor treatment, if this is not preceded by an acid wash the product has a yellow colour, and to avoid this a preliminary wash with 38% acid and 10% alkali is practised. Various inhibiting reagents have been tried, the best results being obtained by the use of 0·03% of cresol and 0·005% of alpha naphthol. The use of alpha naphthol, however, produces a yellow discoloration on exposure of the spirit to light, and this reagent has been replaced by catechol.

Various methods for the removal of the sulphur compounds which are left in the benzole in the inhibitor process have been examined. The thiophene cannot be removed independently of the unsaturated hydrocarbons, and hence attention has been concentrated on the removal of the carbon bisulphide. By fractionation, a product containing 50% carbon bisulphide together with valuable low boiling oils is the best that has been obtained. The carbon bisulphide can, however, be removed from the benzole by treating with methanol and an alkali—*i.e.*, $CS_2 + NaOH + CH_3OH = NaSCS.OCH_3 + H_2O$. The sodium methyl xanthate which is obtained can be extracted from the benzole by water. To render the process economical it is necessary to recover the methanol and as far as possible the carbon bisulphide. To this end, the xanthate is decomposed by sulphuric acid yielding methanol, carbon bisulphide, and sodium sulphate. The crude carbon bisulphide is separated from the aqueous layer, and from this latter the methanol is recovered by distillation.

A plant which has been erected to treat 7,500 gallons of benzole per week consists of a conventional benzole washer, which is lead-lined and vented to an oxide purifier, as hydrogen sulphide is evolved on the neutralization of the xanthate. In the first fractionation of the alcohol-water mixture a distillate containing 99% alcohol is obtained, and some 90% of the original alcohol is recovered; of the carbon bisulphide removed from the benzole, some 50-60% is recoverable as crude spirit. So far no attempt has been made to refine the crude carbon bisulphide. Tentative costs of the process are given based on a recovery of 85% of the methanol. The cost of removing each 0·1% of sulphur per gallon of benzole varies from 0·04d. to 0·06d. according to the percentage sulphur present in the benzole. The process appears to offer no serious difficulty apart from the danger always attendant on the handling of carbon bisulphide and the evolution of unpleasant vapours from the neutralizing stills.

Various reports are to hand of new benzole plants. At Leeds a plant has been erected consisting of two Holmes multiple washers in which benzole is extracted by creosote, and one washer in which gas oil is circulated for naphthalene extraction (p. 540). To increase the circulation of the wash oil in the washer, centrifugal pumps are provided for each bay. The new plant at Stoke-on-Trent has been officially inaugurated, and it is proposed to market the benzole directly at a price of 1s. per gallon (p. 382).

STORAGE

A description has been given of the various means employed for the repair of holders by electrical welding without putting the holder out of commission (p. 655). For repairs above the water line, a new plate is fixed against the existing defective plate or plates, asbestos cord being interposed as a packing, and the plate directly welded to the existing plates. Where the defects are below the water line, a complete ring of new plates is prepared, the vertical joints being welded *in situ*. This annular ring is then lowered into the cup, the annular space filled with concrete, and the plates welded to the holder shell.

Gas-Works Assessments

By J. H. Allen, F.S.I. (Belfast and Dublin)

[Paper presented at the Annual Meeting of the Irish Association of Gas Managers, Belfast, Aug. 14.]

The members of the Association, or at all events, those whose sphere of operations is in Northern Ireland, will be aware that the work of re-valuation under the Valuation Acts (Amendment Act), 1932, is now well under way, and accordingly your Secretary has asked me to say a few words upon the more important aspects of this important matter, with the hope that my remarks will be of immediate interest, if not assistance, to northern members, and of general interest to those south of the border.

The preliminary step taken by the Commissioner of Valuation under the Act before referred to was to serve upon each undertaking Form No. R.V. 26, which required: (1) That audited accounts should be furnished showing the working of the concern over a period of years; (2) that a large amount of information in very considerable detail should be prepared and furnished to the Commissioner.

It is manifest that the information so given in conjunction with an inspection of the concern by a technical representative of the Commissioner will form the basis for the new valuations.

A Highly Technical Matter.

The valuation of a gas undertaking is a highly technical matter founded upon hypothesis impossible to find in fact; and although for upwards of half a century the courts have commented upon the artificiality of the formula adopted, neither courts nor experts have been able to frame an acceptable alternative method which would meet the conditions laid down in the rating statutes, and the "revenue method" of valuation holds the field in spite of the dictum of the judges that the courts are not precluded from adopting other methods.

I do not propose to discuss in any detail the multitude of elements which have to be considered before the whole structure of a valuation is brought into being, as I suggest that this is a matter for experts to handle.

In Northern Ireland, possibly because of these complexities, no important appeals in regard to the valuations of special properties have come before the courts since 1912, when certain railway cases, in which I had a part, had the attention of the courts for a considerable period. Of course, as I am speaking in Belfast I might attribute this quiescence in litigation to the natural quiet instincts of the northern people and go on to say that in Southern Ireland within the past few years very important issues have come before the courts. I want to refer particularly to one judgment because it should be of the greatest assistance to the Gas Industry, and in this regard I cannot refrain from paying tribute to our good friend Mr. G. Airth, Engineer, Manager, and Secretary of the Dundalk Gas Company, as it was his Company that bore the brunt of the fight and he took a pioneer's part in bringing into being what is now known in Irish rating history as "The Dundalk Judgment."

Now the valuation statutes used in Northern and Southern Ireland are identical in their general application, and, therefore, it follows that judgments delivered by the Free State Tribunal—especially when the particular matter

has received the considered attention of three courts—should apply in their substance in Northern Ireland, even although the two sections of Ireland may not adopt each other's case law.

The Dundalk Judgment.

The particular point established is that a gas undertaking for rating comprises the buildings, retorts, gasholders, the site and the mains and the motive power machinery—leaving the non-motive power machinery and productive apparatus free from assessment. This was in contest in the Dundalk case when a re-valuation arose as the result of the erection of vertical retorts to replace a portion of the horizontals. The receipts were well maintained. In valuation figures the old valuation of £698 was increased to £965, and on appeal to the courts the final figure determined by the supreme court was £523.

That this was a decision of extraordinary moment is evident from the results. As a development of this judgment I handled the case of the Cork Gas-Works assessments in which the circuit court judge made a reduction from £8,000 to £5,000, substantially upon the basis of the Dundalk judgment.

I say that this Dundalk judgment, or the basis upon which it was founded, is applicable to every gas-works and, indeed, electricity and water works and similar undertakings in Northern Ireland. To summarize my point—I contend that for years past it has been the practice of the valuing authorities erroneously to take into account many items of machinery which are in Ireland expressly excluded from valuation. My contention is established in the Irish Free State after successful contest in each of three courts. Identical statutory provisions obtain in Northern Ireland, and the application of the matters decided by the Dundalk judgment within the six counties is now overdue.

I put forward the matter for the consideration of the Association rather than of its individual members, as I do think it would be invidious to leave it to one undertaking here and there to shoulder the burden for the others.

My time is limited, and there are many other matters in the practice of valuations of gas-works which are worthy of consideration and understanding. While I have suggested that the preparation of a valuation of a gas undertaking is a matter for experts, nevertheless it would be desirable for gas engineers and executive officials to have a grasp of the broad principles upon which the work is carried out, so that they may understand the import of the information required either by the Commissioner of Valuation, or collaborate in a full degree with their own expert.

How to Arrive at a Gas-Works Valuation.

Accordingly, to arrive at a valuation, we have to find at what rent a gas-works would let one year with another, and to answer that question we adopt what is called the "revenue basis" of valuation—that is to say, the net receipts are arrived at by deducting the working expenses from the incomings from gas, meter rents, and residuals. Then the tenant's share has to be found by estimating the amount of capital the tenant must bring in in the shape of cash in hand, money to keep the retorts fired with coal over a period—meters, cookers, installations, stores and stocks, tools, furniture, apparatus, and tenant's machinery. To the amount of tenant's capital a reasonable percentage is applied to give the undertaker a fair return upon his money—that is the tenant's share. This tenant's share is then deducted from the net receipts and the balance goes between the rate collector for rates and the landlord for rent.

In arriving at the net receipts, practically every item in the working expenses must be considered in the light of the setting up of a hypothetical tenancy under the valuation code, rather than as actual disbursements by the actual undertaker, and, furthermore, practically every item in the tenant's capital is a matter of estimate and, therefore, the subject of controversy. Accordingly I do suggest that it is in the interests of the Industry to consider these matters carefully, and it would also assist the valuing authorities if concerted action could be arranged in order to meet and endeavour to come to agreement with the valuing authorities upon the many difficult points which arise.

Favourable to the Gas Industry.

Several leading English counsel have advised that the "revenue method" of valuation is not one that is likely to be superseded, and I do say that the results of that method, properly and reasonably applied, are favourable to the Gas Industry. But care should be taken by all parties in its application not to press the formula to an undue extent.

I understand that the new assessments for Northern Ireland will be issued early in 1935. Provisions will be allowed for appeals to the Commissioner of Valuation, and it is then that personal contact could be made with the Commissioner's technical representatives and the various views of ratepayers put forward formally and in detail.

After this there will be occasion for appeals to quarter sessions, and I would suggest that at this stage an effort should be made to fine down the contest to such specific matters as may involve points of general principle rather than of detail.

Discussion.

Col. W. M. CARR remarked that in the variety of communications submitted there were so many points of interest that he found himself rather at a loss in picking out the matters upon which he most desired information. Mr. Allen's paper, dealing as it did with the factor of standing charges, was of vital importance, and those who found themselves responsible for dealing with rating questions on the other side of the water would be interested to hear from Mr. Allen what tenant's machinery was allowed in the Dundalk judgment. They found in England that there was a tendency on the part of many valuers acting for the local authorities to resist, for example, the inclusion of stoking machinery as tenant's capital. In some instances it had been allowed, but in many it had not.

Allowance on Tenant's Capital.

There had also been noticeable, since the advent of cheaper money, a tendency on the part of local authority valuers to cut down the percentage of the allowance on tenant's capital. Going back to the historic Parish of Lee case, the original allowance on tenant's capital was as much as 17½%, but there had been a distinct attempt under the last valuation in Great Britain to cut down the tenant's allowance to a total of 12½%. In the majority of cases the amounts last year varied between 12½% and 15%. What was the usual allowance on tenant's capital in Northern Ireland and the Free State under recent valuations? He was in entire agreement with Mr. Allen as to the desirability of all of them clearly understanding, so far as it was possible, the principles upon which they were rated, because, though they found in England that in some instances the valuers who were going to act for the local authorities did appreciate the correct method of assessment, in the majority of cases they did not properly appreciate it, and so endeavoured to operate the principle against the undertaking. Thus they found a variation in rates from as much as 5d. or 6d. per 1,000 c.ft. of gas sold in some cases down to as low as 1d. or 2d. in others. They must therefore make quite sure that their assessments were based upon a proper valuation.

Mr. J. M'NICHOLL (Cork) remarked that the paper was, of course, a very complicated one, and he doubted very much whether it would be wise for an Association of that character to discuss it in detail. At the same time, they were greatly indebted to Mr. Allen for putting the matter so fully before them. It was very useful for all of them to know something about the method of assessment, especially at this time in the North of Ireland, when a re-valuation was under way. He had had the pleasure of working with Mr. Allen—if one could speak of "pleasure" in connection with subjects of this sort. As a matter of fact, there was very little pleasure to be got out of assessments. They should aim, as far as possible, at keeping clear of the Courts.

Mr. A. S. BROOK (Lisburn) said it might be of interest to some of those present to know that, if they desired it, much valuable information on the subject of assessments, and how to arrive at a valuation, could be obtained from the "GAS JOURNAL" Calendar and Directory, and also from "Administration and Finance of Gas Undertakings," by George Evetts. He himself had gone through these books, and felt much better for having done so.

The PRESIDENT said that unfortunately they had no idea of just how the re-valuation was going to affect them, but they realized the necessity of being ready to put the whole weight of their organizations into the scale so as to secure an equitable decision upon any points that might arise.

Tenant's Machinery Allowance.

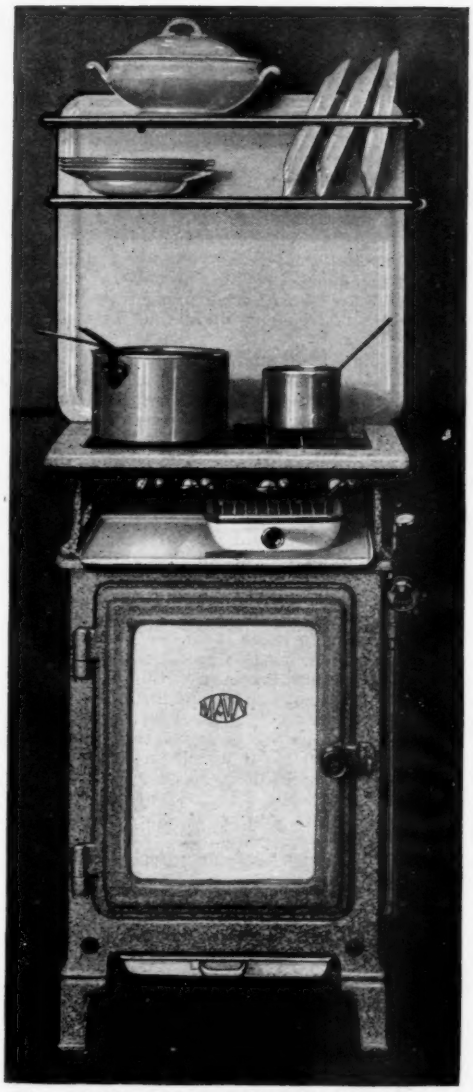
Mr. ALLEN said he did not know whether Col. Carr was aware that the Irish Valuation Code contained a special section exempting from rating machinery other than motive power. With regard to the Dundalk case, this was a pioneer's job, and what happened there was that the Court excluded from valuation the non-motive-power machinery and productive apparatus. Since then they had been able to exclude exhausters, scrubbers, and all things that were typical machinery, and the question now was: "What is a machine?" If a thing was a machine, it was expressly excluded.

With regard to the allowance on tenant's capital, within his own experience it had gone to 20%, just pre-war, and then it came down to 17½%. Since that time he himself had been able to keep it at 15%. An effort had, however, been made in the Free State to put it at 10%, and this effort would be continued. As to the method of valuation, he had never been able to get a definite figure per 1,000 c.ft. of gas sold. It would be a very desirable thing to arrive at such a figure, were it possible to do so. The "GAS JOURNAL" Calendar and the book by Mr. Evetts, he could assure Mr. Brook, were rarely very far from his elbow.

Mr. M'Nicholl had referred to the fact that there was little pleasure in assessment cases, but he would like to say that in Cork Mr. M'Nicholl behaved in a quite determined way, and, in spite of severe questioning by Senior Counsel, helped to win his case.

MAIN

GAS COOKERS



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Radiant Heat and Comfort

By Harold Hartley, D.Sc., Head of the Research Department, Radiation Limited.

[A paper before the Institute of Fuel, to which body we are indebted for the accompanying diagram.]

(*Concluded from p. 422 of the* "JOURNAL" *for August 22.*)

Capillary Blood Flow and Comfort.

It seems not unlikely that the results recorded above are connected with the moisture content of the skin at the time of the exposure. We have found that certain prior treatments which induce an accelerated flow of blood in the surface capillaries increase the ability to endure in comfort the exposure to a high intensity of radiant heat. For example, excitation of the capillary flow by gentle slapping of the arm enables a more prolonged exposure to a high intensity of radiant heat to be endured. On the other hand, we have found that a restriction of the blood-flow induced by adrenalin injections leads to a decrease in the ability to withstand the effects of intense bombardment of the skin by radiant heat. Further, if the increase in the intensity of the radiant energy to which the arm is subjected is effected slowly, the threshold intensity for pain may be raised appreciably. When the arm is cold and dry, the sensation is less comfortable than when the arm is initially warm and moist.

Effect of Sweating on the Sensation of Pain.

An interesting experiment which threw light on the protective properties of the skin was carried out by a member of our staff. The experimenter exposed a portion of the arm (a disc of about 1 in. diameter) to heat, above his threshold intensity, from a gas fire. The body was shielded from the fire with the exception of the part of the arm under treatment. An observer recorded the sensations expressed by the subject, at the same time making a note of the period of the exposure. The results are summarized in Table V.

TABLE V.

Time of Exposure.	Remarks.
Start to 35 seconds	Pleasant sensation.
At 45 ,, ...	Pain beginning.
,, 58 ,, ...	Pain very acute.
,, 60 ,, ...	Pain declining.
,, 77 ,, ...	No further pain.
,, 104 ,, ...	Arm withdrawn: distinct sweating noticeable.

The experimenter had set out with the definite intention of blistering his arm, and after 58 seconds the pain became so great as to be almost unbearable. The exposure was continued, and there was recorded a complete cessation of pain. The part of the surface of the arm which had been exposed to the fire was examined and found to be covered with minute beads of perspiration. It was probably with the onset of the perspiration that the pain had disappeared.

An endeavour was next made to correlate the comfort and pain sensations with the amount of moisture on the surface of the skin. Two copper bands, each 2 cm. wide, were clamped at a distance of 3·8 cm. from one another round the arm of an experimenter. The copper bands were connected each to one of the terminals of a small Moll thermopile, which was exposed to a constant source of radiation, and thus made to generate a minute electromotive force; in the thermopile circuit was a suitable galvanometer. It was felt that variation in the current passing would give a qualitative indication of the amount of moisture on the surface of the skin. The experimenter sat near a gas fire with shields arranged so that, when desired, he could expose to the fire the portion of the arm with the copper bands on it.

At first no current passed, but after the arm had been exposed and then shielded again a number of times, sufficient moisture had been brought near the surface to permit the passage of such current as could be recorded. The procedure consisted in exposing the arm for from 3 to 7 minutes, and then shielding it for from 2 to 5 minutes, recording at short intervals of time the sensations and the thermopile current. The experiment was continued for about three-quarters of an hour, at the end of which time the subject himself had become well heated, although only the arm had been exposed to the fire. The curve in fig. 7 shows a part of the record of the test.

It will be noticed that during the periods of exposure the maximum deflections often coincided with the periods of relative comfort, whilst troughs in the curve corresponded with greater pain. Perfect agreement is not to be expected, as the experimenter had to record observations every few seconds, and there may also be a lag between the movement of the galvanometer needle, the emission of perspiration and the easing of pain, or the evaporation of perspiration and the onset of pain. When carrying out experiments on oneself it seems as though the sensation of pain increases and diminishes in surges. It will be noticed in some cases that after removal of the arm from in front of the fire there was recorded a sharp increase in the galvanometer reading. The effect of the prior treatment had set up perspiration, whilst removal from in front of the fire had decreased the evaporation which normally

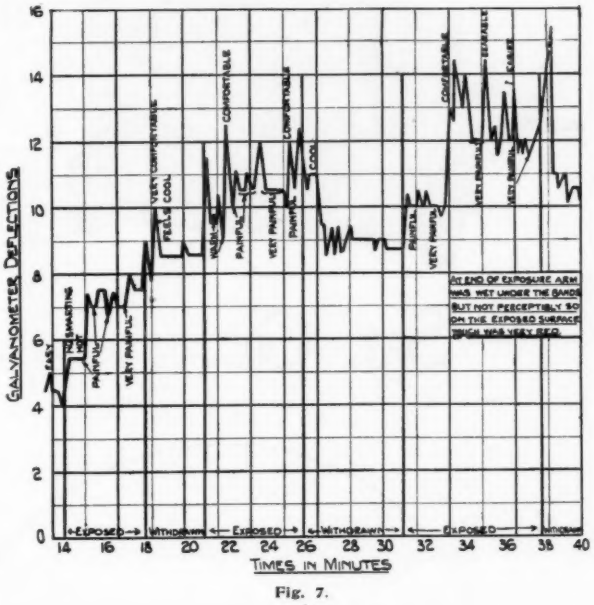


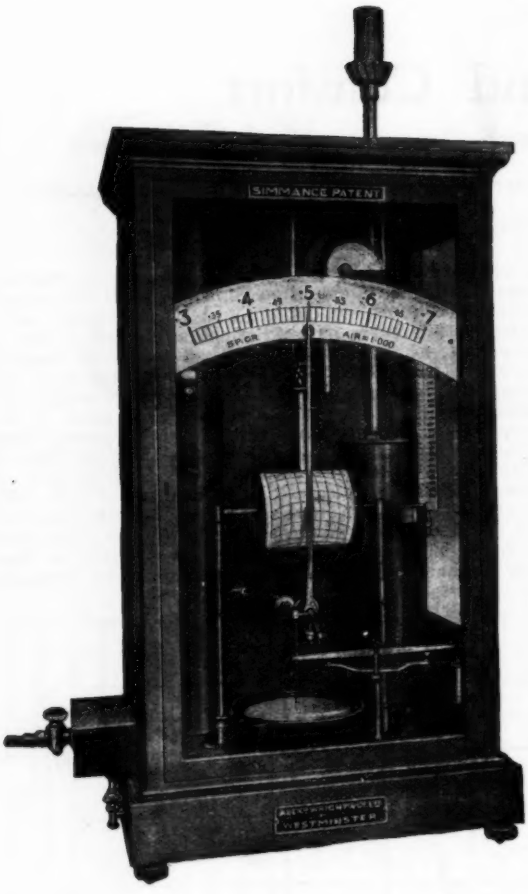
Fig. 7.

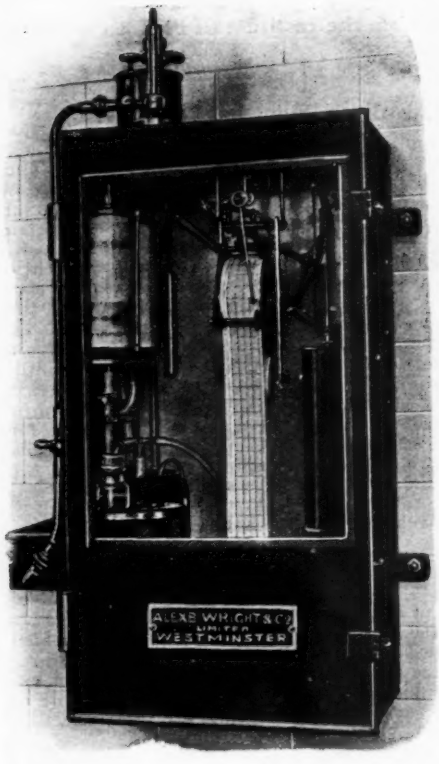
occurred during the heating period. The result on the whole supports the view that the sensations experienced when the naked arm is exposed to the fire are much influenced by the degree of moistness of the skin.

Conclusions.

The work which has been detailed briefly above leads to the following conclusions:

1. Much higher intensities of radiant heat can be borne than are required usually for comfort in a living room.
2. The maximum intensity of heat that can be endured varies with the quality of the energy.
3. In general, the *threshold intensity for pain* increases with the penetrancy of the energy relative to human skin. This result is in agreement with Sonne's finding that a higher intensity of visible energy can be borne than of short infra-red energy, and of short infra-red energy than of long infra-red energy.
4. The *threshold intensity for pain* is affected by the general condition of the portion of the body exposed to the heat, being the higher the greater the capillary flow and the more moist the skin.
5. Under the influence of radiant heat, subcutaneous temperatures much higher than blood heat can be attained and maintained.
6. The effect of a heat treatment persists for some time after the end of the exposure, and even after the subcutaneous temperature (2 mm. depth) has fallen about to the original value.
7. Sweating relieves pain, provided permanent damage to the skin cells has not been caused.





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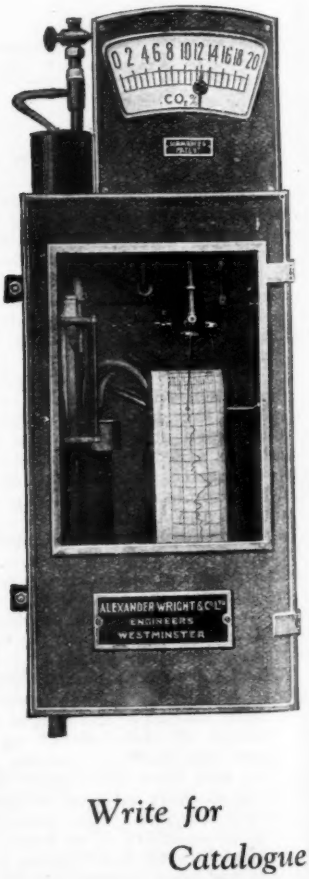

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Stock Market Report.

[For Stock and Share List, see later page.]

The past week saw the end of the last Account for the holiday period, and if the volume of business done during the preceding few weeks is any criterion the hopes of profitable activity in the autumn would appear justified. Large buying of gilt-edged securities continued and prices hardened, while the latest goods traffic returns gave a fillip to railway stocks. The Industrial market was active and prices well maintained, brewery, cable, and tobacco shares being strong features.

The volume of business in the Gas market was a trifle less than that of the previous week. There were several upward price movements, however, including Plymouth and Stonehouse, which fully recovered the 7 points drop to which attention was drawn in last week's Report, and a gain of 5 in Alliance and Dublin ordinary to 140. Commercial 3% and 5% debentures hardened 1 and 2 respectively, and Mid-Southern 4% preference was also marked up 2 to 99½, business being recorded at 101. On the other hand, Newcastle units, which dropped 6d. *ex* dividend last week, weakened a further 4½d. to 25s. 9d. on the local Exchange, but it is interesting to note that a parcel of these units is on offer in London at 26s. 3d.

Investors in Gas stocks and shares during the past few years have every reason to be well satisfied with their choice of investment, for not only have dividends been for the most part maintained, and in some cases increased, but their capital has very largely appreciated. This is illustrated in the following table which shows the upward movement in prices for each year since 1931 to date. It will be noticed that the only set-back has occurred in Imperial Continental stock, which is now 10 points lower than at this time in 1933.

Ordinary Stocks.

—	Aug. 21, 1931.	Aug. 25, 1932.	Aug. 25, 1933.	Aug. 24, 1934.
Alliance and Dublin	104½	105	125	140
Bournemouth 7%	127½	137	162½	168½
Brighton 6%	114½	140	155½	165½
Bristol	96½	108	110	117
British	112½	137	149½	160½
Cardiff	96½	100½	119½	131
Commercial	93½	104½	116½	120½
Croydon sliding-scale	108½	135	145½	155½
Gas Light units	19s. 3d.	23s.	26s.	26s. 9d.
Imperial Continental	160	192	220	210
Liverpool	99½	111	124½	133
Newcastle units	16s. 4½d.	20s. 6d.	24s. 7½d.	25s. 9d.
Portsmouth	124½	142	165½	168½
Sheffield	106	110	128½	140
South Metropolitan	102½	116	127½	136½
South Suburban	102½	114½	124½	134½
Southampton	79½	95½	110½	110½
Tottenham	103½	129½	145½	155½
Wandsworth	112½	137½	147½	159½

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *Aug.* 27.

There are no changes to report in the tar products market, and to-day's prices are as follows:

Pitch, about 57s. 6d. per ton f.o.b.

Creosote, 4d. to 4¼d. per gallon.

Refined tar, 4d. to 4¼d. per gallon in bulk at makers' works.

Pure toluole, about 2s. 2d. to 2s. 3d.; pure benzole, 1s. 9d. to 1s. 10d.; 95/160 solvent naphtha, 1s. 7d. to 1s. 8d.; and 90/160 pyridine, 7s. to 7s. 6d., all per gallon naked at makers' works.

Tar Products in the Provinces.

Aug. 27.

The average prices of gas-works products during the week were: Gas-works tar, 25s. to 30s.; Pitch—East Coast, 55s. to 57s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 55s. to 57s. 6d.* Toluole, naked, North, 1s. 8d. to 1s. 10d. Coal-tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 9¾d. to 10¾d. Creosote, *ex* works, in bulk, North, liquid and salty, 3½d. to 3¾d.; low gravity, 3d. to 3¼d.; Scotland, 3d. to 3¼d. Heavy oils, in bulk, North, 3¾d. to 4¼d. Carbolic acid, 60's, 1s. 10d. to 1s. 11d. Naphthalene, £10 to £11. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Aug.* 25.

Values are unchanged, with demand about equal to supplies. There is still a dearth of inquiries for pitch, however, and no alteration is expected for some time yet.

Crude gas-works tar.—The actual value remains at 34s. to 36s. per ton *ex* works in bulk.

Pitch.—There is still little or no interest being taken for shipment during the coming season and export price remains nominal at 45s. per ton f.o.b. Glasgow, while in the home market about 42s. 6d. per ton *ex* works in bulk is being quoted.

Refined tar.—Distillers are holding for 3d. to 3¼d. per gallon in buyers' packages at makers' works.

Creosote oil.—Production is well looked after in this district and prices continue firm. B.E.S.A. Specification oil is 4d. to 4¼d. per gallon; low gravity, 4¼d. to 4¾d. per gallon; and neutral oil, 4¼d. to 4¾d. per gallon; all f.o.r. in bulk.

Cresylic acid.—Prompt supplies are quite scarce and quotations are steady. Pale, 97/99%, is 1s. 3d. to 1s. 4d. per gallon, dark, 97/99%, 1s. 0¼d. to 1s. 1½d. per gallon; and pale, 99/100%, 1s. 4½d. to 1s. 5½d. per gallon; all *ex* works.

Crude naphtha continues to command 4¾d. to 5¼d. per gallon, according to quality.

Solvent naphtha.—90/160 grade is 1s. 3d. to 1s. 4d. per gallon, and 90/190 grade 8d. per gallon.

Motor benzole.—Value is nominal at 1s. 5d. per gallon.

Pyridines.—90/160 grade is 6s. to 7s. per gallon, and 90/140 grade 7s. to 8s. per gallon (nominal).

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole	0	9	to	0	9½	per gallon at works
Motor "	1	3¾	"	1	4	" " "
90% "	1	4	"	1	4¼	" " "
Pure "	1	7¼	"	1	8	" " "

Contracts Advertised To-Day.

Meters.

Hereford Gas Department. [p. 475.]

Pipes (Wrought Iron, Lead, and Compo).

Hereford Gas Department. [p. 475.]

Trade Notes.

B.E.N. Patents, Ltd.

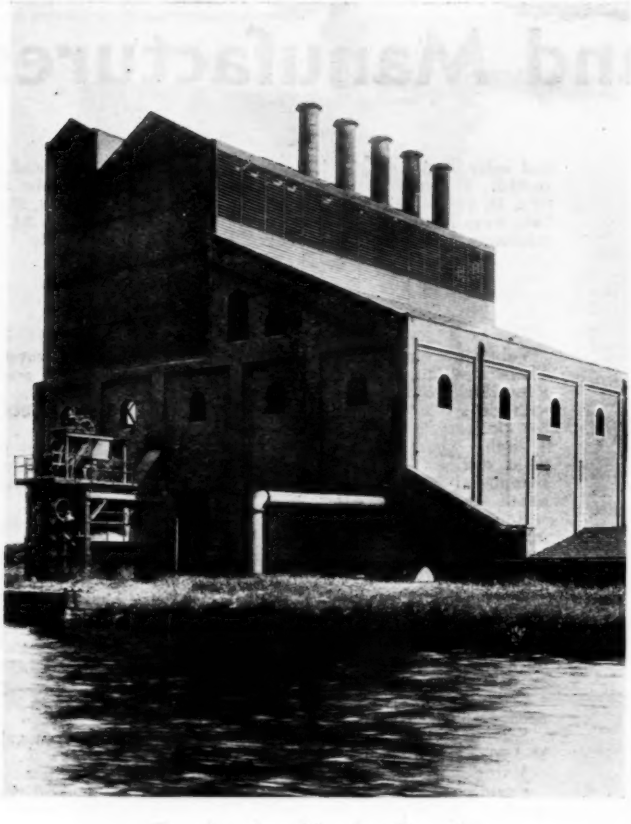
We have received from Messrs. B.E.N. Patents, Ltd., a copy of their list CB-33, giving details of their "S" Type spray gun which they have recently placed on the market.

Simon-Carves, Ltd.

The Shelton Iron, Steel, and Coal Company, Ltd., Stoke-on-Trent, have placed an order with Messrs. Simon-Carves, Ltd., for a battery of 24 coke ovens. The ovens will be of the "Underjet" compound twin-flue type, built in high silica, and designed for firing by either rich or lean gas or both. Messrs. Simon-Carves have also received an order from the same firm for an electrostatic detarring plant for use on coke oven gas plant.

Browett-Lindley Steam and Motor Driven Compressors.

Amongst recent contracts, Messrs. J. Browett-Lindley (1931), Ltd., Letchworth, Herts., have secured an order for two steam driven gas compressor units which will be installed in the Primitiva Gas Company's Works at Buenos Aires. Each compressor will be of the single stage vertical type, having a capacity of 180,000 c.ft. of free gas per hour, and driven by a separate two cylinder compound steam engine. In addition to the normal shaft throttle governor, the engines will be fitted with a Browett-Lindley oil-relay governor which will ensure that the output of gas is exactly controlled to meet the demand.



F A L K I R K

CO LTD

ANOTHER 'REPEAT ORDER' FOR GLOVER-WEST VERTICALS

Falkirk adopted continuous carbonization on the Glover-West System in 1921, and the plant of forty vertical retorts illustrated above has supplied the gas requirements of the burgh continuously since that year. The new unit will have eight retorts of the steaming model, with an estimated daily gasmaking capacity of 720,000 cubic feet. There are now more than 350 installations of Glover-West vertical retorts in service or on order, with an estimated total daily output of 520 million cubic feet of gas.

GLOVER-WEST
VERTICAL RETORTS

•

WEST VERTICAL
INTERMITTENT
CARBONIZING CHAMBERS

•

THE WEST
LIP-BUCKET CONVEYOR
WITH AUTOMATIC LUBRICATION

•

CONVEYORS AND
ELEVATORS

•

COAL AND COKE
CUTTING AND GRADING
PLANT, ETC.

WEST'S CARBONIZING AND FUEL-HANDLING SYSTEMS

WEST'S GAS IMPROVEMENT CO., LTD.

TELEPHONE :
COLLYHURST 2961

MILES PLATTING, MANCHESTER 10

TELEGRAMS :
STOKER, MANCHESTER

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

Issue. £	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. Aug. 24.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
1,551,868	Stk.	Apl 9	7	7	Alliance & Dublin Ord. ...	135–145	+5	139½–139½‡
374,000	"	June 25	4	4	Do. 4 p c. Deb. ...	90–100	...	...
557,655	"	Aug. 13	7	7	Barnet Ord. 7 p.c.	165–170*	...	...
800,000	1	May 7	1/4½	1/9½	Bombay, Ltd.	27/6–29/6	...	...
178,480	Stk.	Aug. 13	9½	9½	Bournemouth sliding scale	212–217*	...	...
550,050	"	"	7	7	Do. 7 p.c. max. ...	166–171*	...	...
439,160	"	"	6	6	Do. 6 p.c. Pref ...	140–145*	...	...
50,000	"	June 11	8	8	Do. 8 p.c. Deb. ...	78–83	...	...
262,025	"	"	4	4	Do. 4 p.c. Deb. ...	103–108	...	...
335,000	"	"	5	5	Do. 5 p.c. Deb. ...	122–127	...	...
357,900	"	Aug. 13	7½	7½	Brighton, &c , 6 p.c. Con. ...	161–166*	...	...
540,000	"	"	6½	6½	Do. 5 p.c. Con. ...	150–155*	+1	153–155
195,500	"	"	6	6	Do. 6 p.c. B. Pref.	138–143*	...	...
1,487,500	"	July 9	5	5	Bristol 5 p.c. max.	116–118a	...	...
120,420	"	June 11	4	4	Do. 1st 4 p.c. Deb. ...	102–105a	...	...
217,870	"	"	4	4	Do. 2nd 4 p.c. Deb. ...	102–105a	...	...
328,790	"	"	5	5	Do. 5 p.c. Deb.	121–123a	...	...
885,000	"	Apl. 9	7	8	British Ord.	158–163	...	161½ 162½
100,000	"	June 11	7	7	Do. 7 p c. Pref.	154–159	...	...
350,000	"	"	5½	5½	Do. 5½ p.c. Pref.	104–109	...	...
120,000	"	"	4	4	Do. 4 p.c. Red. Deb. ...	98–103	...	...
450,000	"	"	5	5	Do. 5 p.c. Red. Deb. ...	107–115	...	...
160,000	"	June 11	5	5	Cambridge 5 p.c. Deb. ...	115–120	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	2–4	...	...
100,000	10	Nov 6	4½	4½	Do. 4½ p.c. Pref. ...	4–6	−1	...
150,000	Stk.	July 23	4½	4½	Do. 4½ p.c. Deb. ...	90–95	...	...
626,860	"	July 23	6	6	Cardiff Con. Ord.	129–133	...	...
237,860	"	June 11	5	5	Do. 5 p.c. Red. Deb.	103–108	...	...
157,150	"	July 23	6½	5	Chester 5 p.c. Ord.	113–118b	...	...
98,936	1	May 7	2/-	2/-	Colombo, Ltd. Ord.	1⅞–1⅞	...	...
24,500	1	"	1/4½	1/4½	Do. 7 p.c. Pref. ...	19/6–21/6	...	...
609,204	1	Mar. 19	/11'48	/11'48	Colonial Gas Assn. Ltd. Ord.	19/6–21/6	...	...
296,053	1	"	1/3'30	1/3'30	Do. 8 p.c. Pref.	25/6–25/6	...	...
1,775,005	Stk.	July 23	6½	5	Commercial Ord.	118–123	...	123
475,000	"	June 11	8	8	Do. 8 p.c. Deb. ...	83–88	+1	87
286,944	"	Aug. 13	5	5	Do. 5 p.c. Deb. ...	120–125*	+2	...
807,560	"	Aug. 13	7	7	Croydon sliding scale ...	152–157*	...	155
569,590	"	"	5	5	Do. max. div.	103–108*	...	...
620,385	"	June 25	5	5	Do. 5 p.c. Deb.... ...	119–124	...	...
542,270	"	Aug. 13	10	7	Derby Con.	175–180c	...	...
55,000	"	June 25	4	4	Do. 4 p.c. Deb.	97–100c	...	...
209,000	"	Aug. 13	5	5	East Hull Ord. 5 p.c. ...	104–109*	...	106½
181,625	"	Aug. 13	6	6	East Surrey Ord. 5 p.c. ...	126–131*	...	...
175,509	"	June 11	5	5	Do. 5 p.c. Deb.	120–125	...	...
1,002,180	"	Apl 9	†6	†7	European, Ltd.	124–129	...	126½–129
19,342,763	"	Aug. 13	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	26/6–27/-f*	...	26/6–26/9
2,600,000	"	"	3½	3½	Do. 3½ p.c. max. ...	87–90*	...	89½
4,477,108	"	"	4	4	Do. 4 p.c. Con. Pref. ...	104–107*	...	106⅝ 106⅝
6,102,497	"	May 28	3	3	Do. 3 p.c. Con. Deb. ...	86–89	...	87½–88½
3,643,770	"	"	5	5	Do. 5 p.c. Red. Deb. ...	115–118	...	118½
3,500,000	"	"	4½	4½	Do. 4½ p.c. Red. Deb. ...	113–116	...	115½–115½
270,466	"	Aug. 13	6	6	Harrogate New Cons. ...	127–132*	...	...
140,000	1	Apl. 23	1/7½	1/7½	Hongkong & China, Ltd. ...	18–18	...	...
318,200	Stk.	Aug. 13	6	6	Hornsey Con. 3½ p.c. ...	127–132*	...	...
5,600,000	"	May 28	10	14	Imperial Continental Cap.	205–215	...	206½–208
228,130	"	July 23	3½	3½	Do. 3½ p.c. Red. Deb.	92–97*	...	94½–94½
235,242	"	Aug. 13	8½	8½	Lea Bridge 5 p.c. Ord. ...	165–172*	...	...
2,167,410	"	Aug. 13	5	6	Liverpool 5 p.c. Ord. ...	182–184b	+1½	...
245,500	"	June 11	5	5	Do 5 p.c. Red. Pref. ...	101–111b	...	...
306,083	"	July 16	4	4	Do. 4 p.c. Deb. ...	100½–102½b	...	...
165,786	"	Feb 19	8	10	Maidstone 5 p.c. Cap. ...	180 190	...	...
56,176	"	June 25	3	3	Do. 3 p.c. Deb. ...	71–76	...	...
75,000	"	May 28	†10	†10	Malta & Mediterranean ...	200–210	...	...
392,000	"	Apl 3	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	101 104	...	...
231,978	Stk.	Aug. 13	5	5	M. S. Utility "C." Cons. ...	111 116*	...	...
818,657	"	"	4	4	Do. 4 p.c. Cons. Pref.	97 102*	+2	101
300,075	"	June 11	4	4	Do. 4 p.c. Deb. ...	100–105	...	104
148,955	"	"	5	†5	Do. 5 p.c. Deb. ...	119–124	...	...
125,000	—	July 2	...	11/8	Do 3½ p.c. Rd. Rg.Bds.	97–100	...	...
675,000	"	May 28	†6	†13	Montevideo, Ltd.	68 68	...	...
2,061,315	"	Aug. 13	6½	5	Newcastle & Gateshead Con.	25/3–26/3d/*	−/4½	...
682,886	"	"	4	4	Do. 4 p.c. Pref. ...	99½–100½d*	...	...
776,706	"	June 11	3½	3½	Do. 3½ p.c. Deb. ...	90½–91½d	...	...
277,285	"	May 7	5	5	Do. 5 p.c. Deb. '48 ...	106–107d	...	...
274,000	"	Aug. 13	5	5	Newport (Mon.) 5 p.c. max.	105–107a*	...	...
204,940	"	Aug. 13	7½	7½	North Middlesex 6 p.c. Con.	183–188*	...	...
396,160	"	Aug. 13	5	5	Northampton 5 p.c. max. ...	102–107*	...	...
300,000	"	May 7	†9	†7	Oriental, Ltd.	162–167	...	...
416,617	"	June 11	8	8	Plym'th & Stonehouse 5 p.c.	167–172	+7	...
504,416	"	Aug. 13	8	8	Portsm'th Con. Stk. 4 p.c. Std	166–171*	...	...
241,446	"	"	5	5	Do. 5 p.c. max. ...	103 108*	...	...
114,000	"	July 23	5	5	Preston 5 p.c. Pref.	101–106	...	...
1,736,968	Stk.	Mar. 19	6	6	Sheffield Cons.	139–141e	...	...
95,000	"	July 9	4	4	Do. 4 p.c. Deb.	100 104e	...	...
133,201	"	Aug. 13	5	8½	Shrewsbury 5 p.c. Ord. ...	137–142*	...	...
90,000	10	May 28	†4	†3	South African	2–4	...	...
889,095	1	May 7	1/2⅞	1/2⅞	South East'n Gas Cn. Ld. Ord.	27/9–28/9	...	28/9–28/10½
786,061	1	Apl. 9	-/10⅞	-/10½	Do. 4½ p c. Red. Cum. Pref	21/9–22/9	...	22/6
450,000	Stk.	Aug. 13	74/1	4	Do. 4 p.c. Red. Deb. ...	100–102*	...	...
6,709,895	"	Aug. 13	7	8	South Met. Ord.	135–138*	...	137–138½
1,135,812	"	"	6	6	Do. 6 p c. Irred. Pf.	141–146*	...	...
850,000	"	"	4	4	Do. 4 p.c. Irred. Pf.	102–106*	...	...
1,895,445	"	June 25	3	3	Do. 3 p.c. Deb ...	84–87	...	88
1 000,000	"	July 9	5	5	Do. 5 p.c. Red. Deb.	113–116	...	...
209,820	"	Aug. 13	8½	8½	South Shields Con.	164–166d*	...	...
1,543,795	"	July 9	6	6	South Suburban Ord. 5 p.c.	133–136	...	133
512,825	"	"	5	5	Do. 5 p.c. Pref.	120–125	...	...
300,000	"	"	4	4	Do. 4 p.c. Pref.	101–106	...	...
868,887	"	June 11	5	5	Do. 5 p.c. Deb.	121–126	...	124½
100,000	"	"	4	4	Do. 4 p.c. Deb.	102–107	...	104½ 105½
647,740	"	Aug 13	5	5	Southampt'n Ord. 5 p.c. max.	108–115*	...	...
121,275	"	June 11	4	4	Do. 4 p.c. Deb.	99–104	...	...
350,000	"	Aug. 13	5½	5½	Swansea 5½ p.c. Red. Pref.	107–112*	...	...
200,000	"	June 11	6½	6½	Do. 6½ p.c. Red. Deb.	100–105	...	...
1,076,490	"	Aug. 13	6½	6½	Tottenham and District Ord.	153–156*	+1	155–157
409,835	"	"	5½	5½	Do. 5½ p.c. Pref. ...	125–130*	...	...
62,235	"	"	5	5	Do. 5 p.c. Pref. ...	113–118*	...	...
199,005	"	June 11	4	4	Do. 4 p.c. Deb. ...	100–105	...	103½
349,110	"	Aug 13	7	7	Uxbridge, &c., 5 p.c. ...	153–158*	...	156½–157½
88,880	"	"	5	5	Do. 5 p.c. Pref. ...	112–117*	...	...
1,322,220	"	Aug. 13	7	7	Wandsworth Consolidated	157–162*	...	159–161½
1,096,378	"	"	5	5	Do. 5 p.c. Pref.	119–124*	...	122–122½
1,317,964	"	June 11	5	5	Do. 5 p.c. Deb.	121–126	...	124½ 125½
203,300	"	"	..	26/8	Do. 4 p.c. Deb.	104–107	...	...
158,400	"	Aug 13	6g	5	Winchester W.& G.5 p.c.Con.	115–120*	...	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock *g.*—Paid £3, including 10s. on account of back dividends. * Ex. div. † Paid free of income-tax. ‡ For year.

STOCK FOR SALE BY TENDER.

THE GREAT WIGSTON GAS COMPANY.

SALE BY TENDER OF

£15,000

ORDINARY STOCK,

Carrying a Standard Rate of Dividend of 6%, in Lots of £10 Each.

THE Company is prepared to receive TENDERS for the above mentioned ORDINARY STOCK, or any part thereof, in Lots of £10 each.

The sale is subject to the Conditions of Sale mentioned below.

The stock will rank *pari passu* with the existing Ordinary Stock of the Company, except that the standard rate of dividend will be six per cent. per annum.

Tenders, to be accompanied by a deposit of one quarter of the nominal amount of stock tendered for, must be received by the undersigned not later than noon on the 8th September, 1934.

Forms of Prospectus containing the Conditions of Sale and Application Forms may be obtained from the Company's Solicitors, Messrs. INGRAM & Co., 8, FRIAR LANE, LEICESTER, or from the undersigned on application.

A. T. HARRIS.

Gas Offices,
Great Wigston,
Leicester.

COMPANY NOTICES.

THE EUROPEAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given to Holders of Share Warrants to Bearer that an INTERIM DIVIDEND of 2½ per Cent.—that is, Five Shillings per Share—will be paid, free of Income-Tax, on the 1st October next. Payment will be made by the National Provincial Bank, Ltd., 1, Princes Street, E.C. 2, after Serial Coupon No. 116 has been left there Three Clear Days for Examination.

AND NOTICE IS HEREBY FURTHER GIVEN that the TRANSFER BOOKS WILL BE CLOSED from the 12th September to the 29th September, both days inclusive.

T. H. MARTIN,
Secretary.

Montague House,
Devonshire Square, E.C. 2,
Aug. 21, 1934.

CONTRACTS OPEN.

CITY OF HEREFORD.

(GAS DEPARTMENT.)

TENDERS, to be delivered by 9 a.m. on 21st September, 1934, are invited for the Supply of the under-mentioned GOODS for the period commencing October 1st and expiring March 31st, 1935:

Ordinary and Prepayment GAS METERS.
WROUGHT IRON TUBES and FITTINGS.
LEAD and COMPO GAS PIPE.

Particulars and Conditions of Tender may be obtained from the Engineer and General Manager, Gas-Works, Mortimer Road, Hereford.

The Corporation do *not* bind themselves to accept the lowest or any Tender.

T. B. FELTHAM,
Town Clerk.

Town Hall,
Hereford,
Aug. 25, 1934.

GEORGE WILSON GAS METERS, Ltd
for
GAS-METERS, ORDINARIES, SLOTS, AND REPAIRS.
Foleshill Road, COVENTRY.
'Phone: 8655 Coventry. Grams: "GASMETER."
And at
LONDON, MANCHESTER, BLACKPOOL, and LEEDS.
(*See advertisement Aug. 22, p. 307.*)

MAINLAYING

E. E. JEAVONS & CO., LTD.,
Gas Engineers and Mainlayers,
TIPTON, STAFFS.

The 'Sergeant' shows some Specialities

The A.E.M. 1/12th cub.ft. CALORIMETER METER. These accurate little instruments are designed primarily for laboratory and scientific work. tailed particulars will be sent on request.

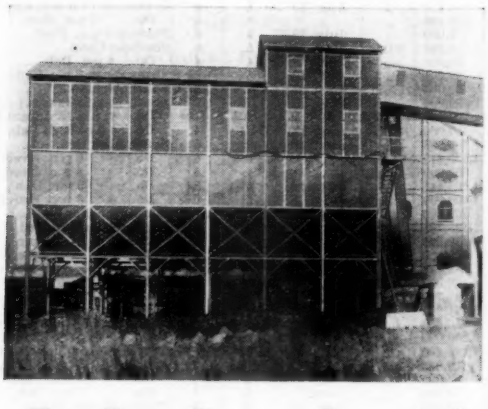
ALDER & MACKAY LIMITED

MAKE METERS OF METICULOUS MEASUREMENT

ALDER & MACKAY LTD., EDINBURGH, LONDON & BRADFORD

MODERN COKE SCREENING AND GRADING PLANTS

All plants designed to include modern up-to-date units.



Our Technical Staff is at your service to prepare designs to suit local conditions.

Your enquiries are invited.

The New Conveyor Co., Ltd., Smethwick

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